

DOCUMENT RESUME

ED 177 349

CI 023 044

TITLE Energy Conservation Curriculum for Secondary and Post-Secondary Students. Module 3: Understanding Utility Bills.

INSTITUTION Navarro Coll., Corsicana, Tex.

SPONS AGENCY Texas Education Agency, Austin.

PUB DATE Apr 79

NOTE 67p.; For related documents see CE 023 042-052 ; Best copy available

EDRS PRICE MF01/PC03 Plus Postage.

DESCRIPTORS Conservation Education; *Costs; Energy; *Energy Conservation; *Instructional Materials; Postsecondary Education; Secondary Education; *Services; *Utilities; *Vocational Education

IDENTIFIERS Texas

ABSTRACT

This module is the third in a series of eleven modules in an energy conservation curriculum for secondary and postsecondary vocational students. It is designed for use by itself or as part of a sequence of four modules on understanding utilities (see also modules 5-7). The objective of this module is to introduce the student to utility bills used for residential and commercial customers. First, an introduction to the module and definitions of key terms are provided. Next, the text is presented in the following five units: (1) electric meters; (2) electric rates; (3) the electric bill; (4) gas meters and gas rates; and (5) the gas bill. The information in each unit is presented in lecture format accompanied by laboratory exercises and questions/examples for class discussion. A bibliography and several charts illustrating the text material are found at the end of the module. (BM)

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ED177349

TEXAS EDUCATION AGENCY

Project Number: 78230154
Control Number: 851/10/3/77/17-872

Energy Conservation Curriculum for Secondary
and Post-Secondary Vocational Students. Module 3.

UNDERSTANDING UTILITY BILLS

BEST COPY AVAILABLE



April, 1979

U.S. DEPARTMENT OF HEALTH,
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MODULE 3

UNDERSTANDING UTILITY BILLS

This module is one of a group of 11 modules in an energy conservation curriculum for secondary and post-secondary vocational students. Understanding Utility Bills may be offered by itself or as part of a sequence of three modules in the following order:

<u>Order</u>	<u>Module</u>	<u>Title of Module</u>
1	3	Understanding Utility Bills
2	5	Lighting Conservation Opportunities
3	7	Appliance Energy Conservation Opportunities

MODULE 3

UNDERSTANDING UTILITY BILLS

MODULE DESCRIPTION:

The student will be introduced to the utility bills used for residential and commercial customers. The electric bill will be discussed in terms of terminology and definition, cost breakout, meter readings, and rate schedules. Natural gas utility bills will be discussed in terms of terminology and definitions, heat content, cost per unit, meter reading, and rate schedules. The types of utility meters will be discussed as monitoring devices for the amount of energy used. Demand meters and energy indicators must be identified and understood in order for the particular knowledge learned to be generalized.

INTRODUCTION:

The American consumer is made aware of the energy he or she consumes by receiving a periodic utility bill. This bill expresses the amount of energy used, the price per unit or rate of charge, and the amount of money due for this expense. The bill is based on the number of utility units used as indicated on the utility meter. In order to monitor the amount of energy used so that energy conservation measures can be evaluated, the student must know how to read utility meters.

MODULE #3

UNDERSTANDING UTILITY BILLS

TERMINOLOGY

alternating current (AC) - electric current that reverses direction periodically, usually many times per second.

armature - that part of an electric rotating machine that includes the main current - carrying winding in which the electromotive force produced by magnetic flux rotation is induced; it may be rotating or stationary.

current - the net transfer of electric charge per unit time.

demand rate - any method of charge for electric service which is based upon or is a function of the extent of use or size of the customer's installation or maximum demand during a given period of time.

direct current (DC) - any combination of electric current which flows in one direction only, such as generators and batteries, in conjunction with transmission lines, resistors, and power converters such as motors.

gross amount - an overall total exclusive of any deductions.

kilowatt-hour - a unit of power equal to 1000 watts; equals about 3,400 BTU's.

net amount - a total free from all charges or deductions.

odometer - an instrument for measuring the distance traveled by a vehicle.

resistor - a device designed to have a definite amount of resistance; used in circuits to limit current flow or to provide a voltage drop.

voltage - potential difference or electromotive force measured in volts.

watt-hour - a unit of energy used in electrical measurements, equal to the energy converted or consumed at a rate of 1 watt during a period of 1 hour.

wattmeter - an instrument that measures electric power in watts ordinarily.

MODULE 3

UNDERSTANDING UTILITY BILLS

UNITS:

1. Electric Meters
2. Electric Rates
 - A. Meter Rates
 - 1.) Straight Line Meter Rate
 - 2.) Step Meter Rate
 - 3.) Block Meter Rate
 - B. Demand Rates
 - 1.) Flat demand Rate
 - 2.) Wright Demand Rate
 - 3.) Hopkinson Demand Rate
 - 4.) Three Part or Three Charge Rate
3. The Electric Bill
 - A. Texas Power and Light Company
 - B. Texas Power and Light Rate Schedule
4. Gas Meters and Gas Rates
 - A. Gas Meter
 - B. Gas Rates
 - 1.) Straight Line Rate
 - 2.) Step Rate
 - 3.) Block Rate
 - 4.) Block Rate with Small Initial Block which Constitutes minimum Monthly Bill.
 - 5.) Service Charge Rate with Straight Line Consumption Charge.
 - 6.) Flat Rate
 - 7.) Wright Demand Rate
 - 8.) Two-Part Rate
5. The Gas Bill
 - A. Lone Star gas Bill
 - B. Lone Star Gas Rate Schedule

MODULE #3

UNDERSTANDING UTILITY BILLS

UNIT 1:

ELECTRIC METERS

OBJECTIVES: At the completion of this unit the student will be able to:

1. Describe how an electric wattmeter works.
2. Explain how to read a home electric meter for watt-hour electrical consumption.

LECTURE

LABORATORY

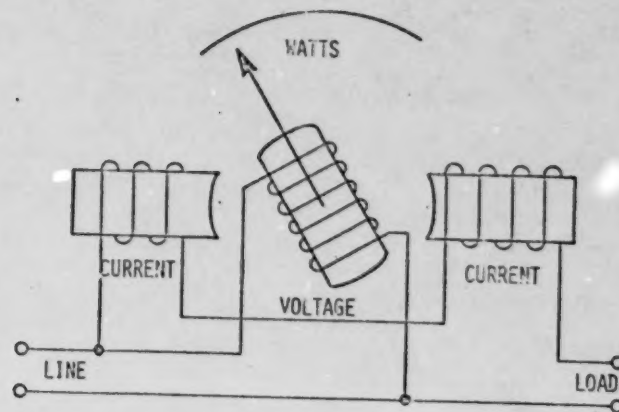
UNIT 1: ELECTRIC METERS

The electric meter located on the outside wall of the home or in the basement is called a wattmeter. It measures electricity used in units called kilowatt hours, abbreviated "KWH".

The power in an electric circuit is equal to the product of the voltage and the current. The wattmeter consists essentially of two coils at right angles, one fixed and one movable. The fixed coil of the electromagnet is made of heavy wire of low resistance and is connected in series with the load. The movable coil is made of small wire and is connected in series across the voltage of a multiplier of high resistance as in Figure 1.1.

These two coils are called the current (fixed coil) and voltage (movable coil) coils. The interaction between the two fields is proportional to the product of the voltage and the current and deflection or movement of the indicating needle is read on a calibrated scale in watts.

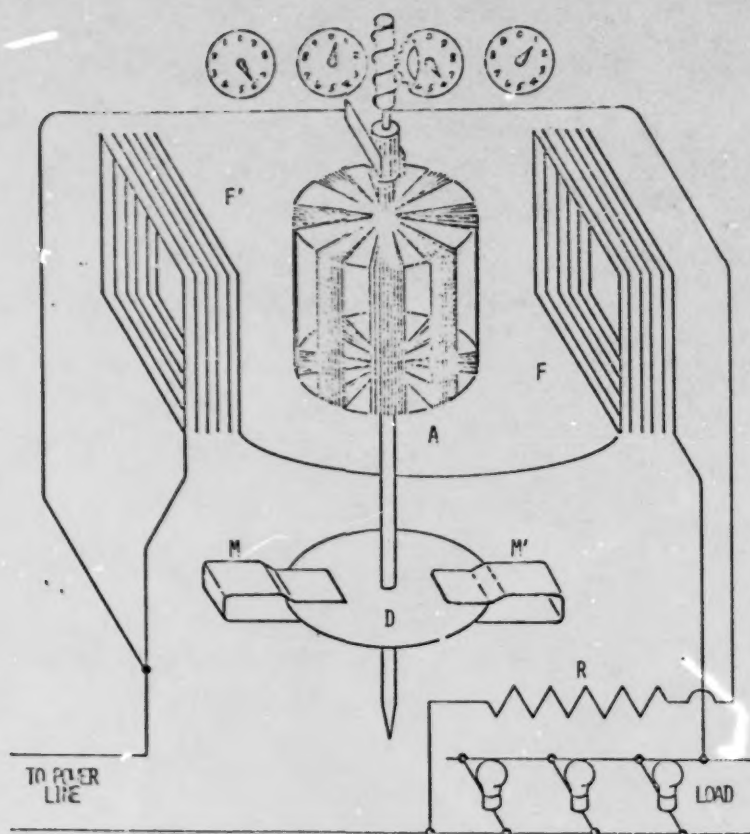
FIG. 1.1. DIAGRAM OF A WATTMETER



The wattmeter will measure the instantaneous power used in the circuit. To determine the amount of power used for a given time, an entirely different device is used, called a watt-hour meter. This meter sums up all the powers used for an interval of time. Such a meter is installed by the power company on the outside of your home. As the watt-hour is a relatively small unit, the customary meter reads in kilowatt-hours or 1,000 watt-hours (KWH). Electric power consumed is paid for at the prevailing rates per KWH.

The watt-hour meter is basically a special type of motor. Figure 1.2 shows it is designed so that the armature A of the motor revolves at a speed that is proportional to the power used.

FIG. 1.2. A WATT-HOUR METER



This is accomplished by having the field coils F and F' of the motor connected in series with the loads, thus producing a magnetic field that is proportional to the current in the load. The armature is connected in parallel with the load, through a multiplying resistor R . Therefore its magnetic field is proportional to the voltage of the load. The torque which results being separately proportional to each of these fields, is therefore dependent upon their product and to the product of current and voltage, or the power.

Suitable pointers, geared to turn with the armature, indicate on their respective dials the number of watt-hours or kilowatt-hour used in the load. The aluminum disk D connected to the armature spindle rotates in the field of the magnetic M and M'. The induced currents thereby generated act as a brake on the armature and provide a mechanism for adjusting the rate of the rotation when the magnets are moved toward or away from the disk in servicing the device.

To read the meter, observe the four dials in Fig. 1.3 Dial A, on the extreme right, reads from 0-10 units of kilowatt hours. For each revolution of dial A, the next dial B reads one. For each revolution of dial B, dial C reads one. For each revolution of dial C, dial D reads one. Mathematically:

Dial A reads in units of one
 Dial B reads in units of ten
 Dial C reads in units of one hundred
 Dial D reads in units of one thousand

To read the meter illustrated in Figure 1.3

Dial A points to 5
 Dial B points between 5 and 6
 Dial C points between 2 and 3
 Dial D points between 4 and 5

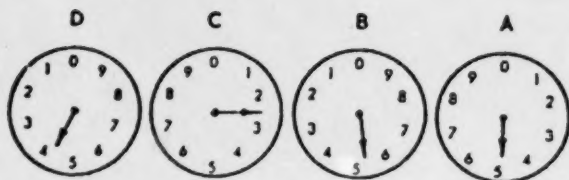


FIGURE 1.3 THE DIALS OF THE WATT-HOUR METER

The correct reading would be, 4255 KWH. Notice that when the indicating arrow is between numbers, the lowest number of the number just passed should be read, not the number the arrow is closest to. Remember, all watt-hour meters measure energy, not power.

The type of watt-hour meter indicated above is usually used on D-C circuits. For A-C circuit use it is modified with a rectifier. A rectifier may be described as a device which permits current to flow in only one direction. When used in a meter, the rectifier allows one half cycle of the AC current to pass, but effectively cuts off the current when it reverses itself in the second half cycle.

Another type of kilowatt-hour meter is the digital type watt-hour meter. This type is easier to read than the dial type because the number of units used is indicated by digital readout. (figure 1.4)

Merely read the numbers from left to right as they appear on the meter. If the number is changing, always read the lower or smaller of the two. On either the dial type or digital type meter, there may be a rating of 10X printed on the face. This means that the number of kilowatt hours shown must be multiplied by 10 to get the true reading of energy used. This is usually also indicated on the electricity bill.

Most residence use the dial or digital watt meter for measuring cumulative units of energy used in a certain period of time. Many commercial buildings, school dormitories, and some farms and ranches use demand meters for indicating the periods of the day or month when the greatest demand for energy occurs. These peak periods are usually recorded on paper graphs or discs similar to the one in Figure 1.5.

The illustration on this page show three sets of meter dials, along with their corresponding readings. Study the sketches carefully; be sure you understand how the readings were made.



READING = 13488



READING = 35721



READING = 66190

Your electric meter is much like the odometer in your family car...it gives a total - cumulative - reading of electrical energy consumption. To find out how much energy you used during a given period of time (say one day, or one week) you must compare readings made at the beginning and end of the period.

MODULE #3

UNDERSTANDING UTILITY BILLS

UNIT 2:

ELECTRIC RATES

OBJECTIVES: At the completion of this unit the student will be able to:

1. Discuss the various rate schedules available for electric companies to use to determine the cost of electricity to the customer.
2. Distinguish between demand rates and meter rates for electric billings.
3. Understand and compute electric costs using straight line meter rates, step meter rates, and block meter rates.
4. Understand and compute electric costs using flat demand rates, Wright demand rates, Hopkinson demand rates, and three part or three charge rates.

LECTURE

LABORATORY

UNIT II:

ELECTRIC RATES:

Understanding meter readings and units of energy consumption is the first step in understanding a utility bill and the amount of money charged or the rate for energy use. The accepted forms of electric rates may be divided into two main classes: Meter Rates and Demand Rates. Each class refers to the kilowatt-hour meter or demand meter readings discussed above.

A. METER RATES

The term "Meter Rate" is applicable to any method of charge for electric service based solely upon quantity. The quantity is expressed in units; as, kilowatt-hours of electricity used.

Straight Line Meter Rate

The term "Straight Line" indicates that the price charged per unit is constant, i.e., does not vary on account of an increase or decrease in the number of units. The Straight Line Meter Rate is the simplest of all meter rates. Figure 2.1 shows this rate graphically.

Example:

Full Schedule Form

5 cents per kilowatt-hour

Abbreviated Form Used in Rate Book

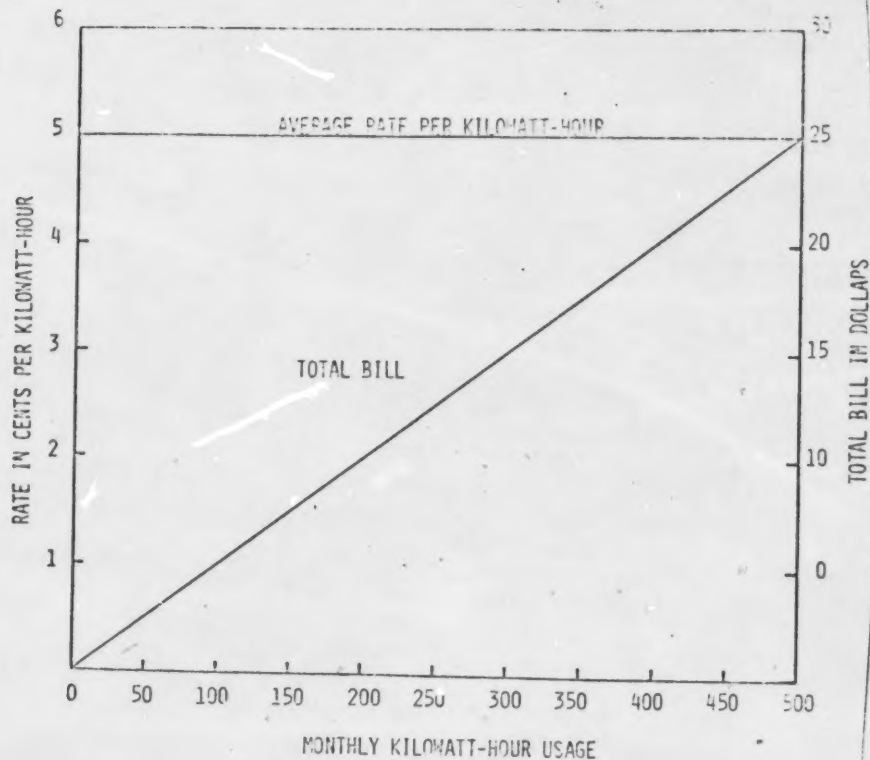
5¢ kwhr

Method of figuring bills

If the customer has a monthly usage of 100 kwhr:

$$100 \text{ kwhr} \times 5\text{¢} = \$5.00$$

FIG. 2.1. STRAIGHT LINE METER RATE



2. Step Meter Rate (Total bill calculated at single rate)

The term "Step" indicates that a certain specified price per unit is charged for the entire usage, the rate depending on the particular step within which the total usage falls.

This type of rate is becoming obsolete and is not permitted by some of the State Commissions. Figure 2.2 shows this rate graphically:

5 cents per kilowatt-hour for from 1 to 50 kilowatt-hours used per month

4 cents per kilowatt-hour for from 51 to 100 kilowatt-hours used per month

3 cents per kilowatt-hour from 101 to 200 kilowatt-hours per month.

2 cents per kilowatt-hour for 201 or more kilowatt-hour used per month.

Abbreviated:

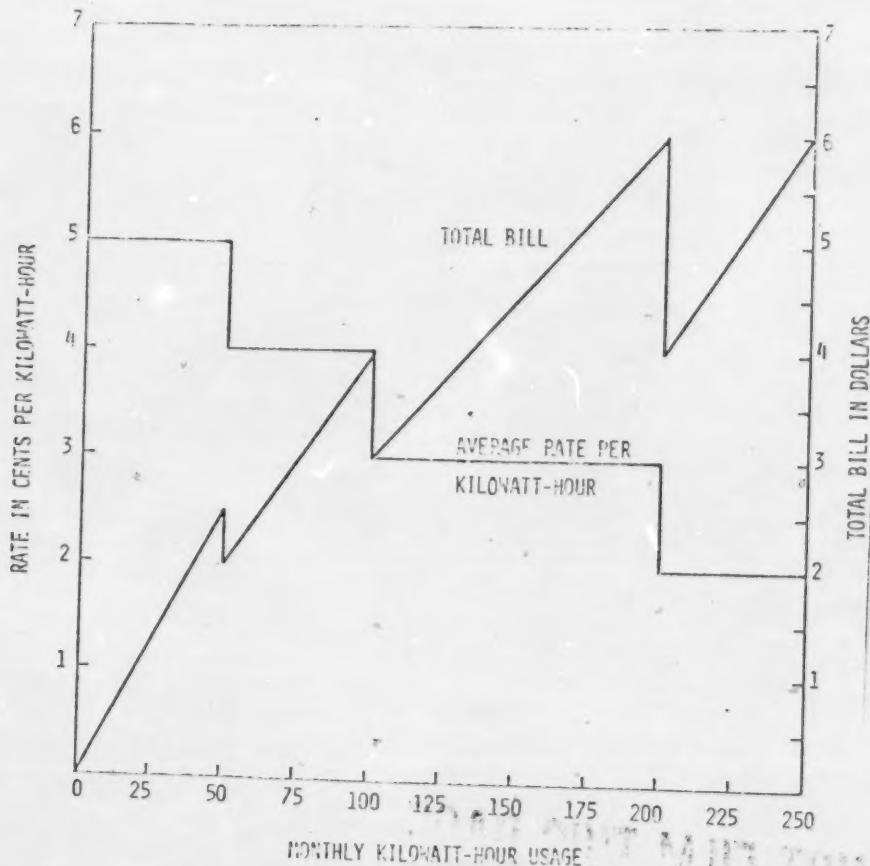
5¢ kwhr	1 to 50 kwhr
4¢ "	51 " 100 "
3¢ "	101 " 200 "
2¢ "	201 kwhr and over

Method of Figuring Bills

Assume customer having monthly usage of 55 kwhr. This usage falls within the step 51 to 100 kwhr charged for at 4¢ per kwhr. This bill would be
 $55 \text{ kwhr} \times 4¢ = \$2.20$

or, assume a customer having monthly usage of 143 kwhr. This usage falls within the step 101 to 200 kwhr charged for at 3¢ per kwhr. This bill would be
 $143 \text{ kwhr} \times 3¢ = \$4.29$

FIG. 2.2. STEP METER RATE



3. Block Meter Rate

The term "Block" indicates that a certain specified price per unit is charged for all or any part of a block of such units, and reduced prices per unit are charged for all or any part of succeeding blocks of such units, each such reduced price per unit applying only to a particular block or portion thereof.

The general simplicity of the rate and the ease with which it is understood by customers are the reasons for its use by many companies. Figure 2.3 shows this rate graphically:

Example:

10 cents per kilowatt-hour for the first 10 kilowatt-hours used per month

4 cents per kilowatt-hour for the next 25 kilowatt-hours used per month

3 cents per kilowatt-hour for the next 65 kilowatt-hours used per month

2.5 cents per kilowatt-hour for the excess over 200 kilowatt-hours used per month.

Abbreviated:

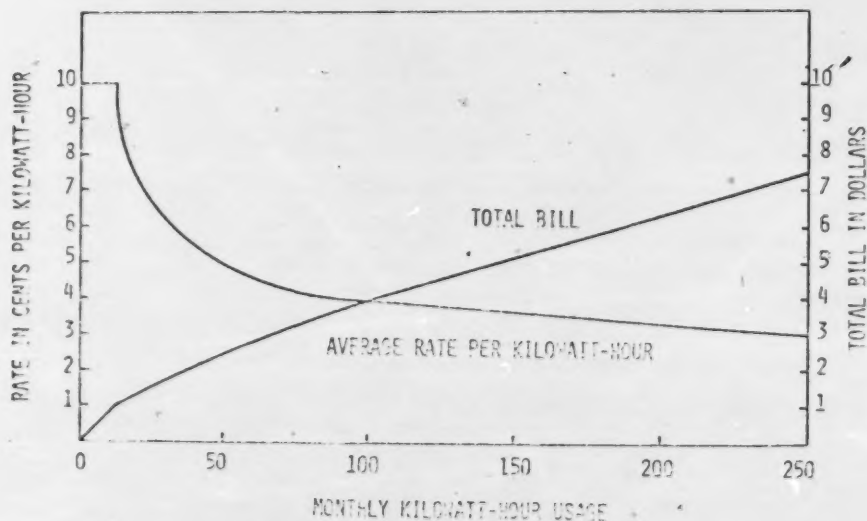
10¢	kwhr	1st	10 kwhr
4¢	"	next	25 "
3¢	"	"	65 "
2.5¢	"	excess	

Method of Figuring Bills

Assume customer having monthly usage of 350 kwhr

10	kwhr	X	10¢	=	\$ 1.00
25	"	X	4¢	=	1.00
65	"	X	3¢	=	1.95
250	"	X	2.5¢	=	6.25
					<u>\$10.20</u>

FIG. 2.3. BLOCK METER RATE



B. DEMAND RATES

The term "Demand Rate" applies to method of charge for electric service which is based upon, or is a function of the extent of use, or size, of customer's installation or maximum demand, during a given period of time. The demand is generally expressed in watts, kilovolt-amperes, or horsepower.

Flat Demand Rate

The term "Flat Demand Rate" applies to a charge for electric service based upon the customer's installation of energy-consuming devices. This is usually so much per watt, per watt, or per horsepower per month or per year. Sometimes this type of rate is nominally so much per customer per year or per month for each of various classes of customers, but estimated demand and quantity of energy likely to be used play an important part in the determination of the class. Such a rate may be modified by the "Block" or "Step" method.

Example:

\$ 1.00 per month for each 50 watts of installation connected or,
\$25.00 per year for each horsepower of the connected load, or
\$40.00 per year per kilowatt for each of the first 25 kilowatts of maximum demand, and \$30.00 per year per kilowatt for each kilowatt in excess of 25

Abbreviated:

\$ 1.00 per 60 watts connected, or
\$25.00 per yr per HP connected, or
\$40.00 per yr per KW 1st 25 KW of demand
\$30.00 per year KW excess

Method of Figuring Bills

Assume a customer having a connected load of 600 watts. At first rate above, the bill would be

$$\frac{600 \times \$1.00}{50} = \$12.00$$

Wright Demand Rate:

The term "Wright Demand Rate" applies to that method of charge which has the first to recognize load factor conditions and in which the demand costs were included in an initial high rate per kilowatt-hour, applicable to a certain number of hours' use of a customer's load, all excess kilowatt-hours being at a lower rate. This method of charge was first proposed by Mr. Arthur Wright in 1896. Figure 2.4 shows this rate graphically:

Example:

10 cents per kilowatt-hour for electricity used equivalent to, or less than, the first 30 hours' use per month of the maximum demand.

5 cents per kilowatt-hour for additional electricity used equivalent to, or less than, the next 30 hours' use per month of the maximum demand.

3 cents per kilowatt-hour for electricity used per month in excess of the equivalent of 60 hours' use of the maximum demand.

Abbreviated:

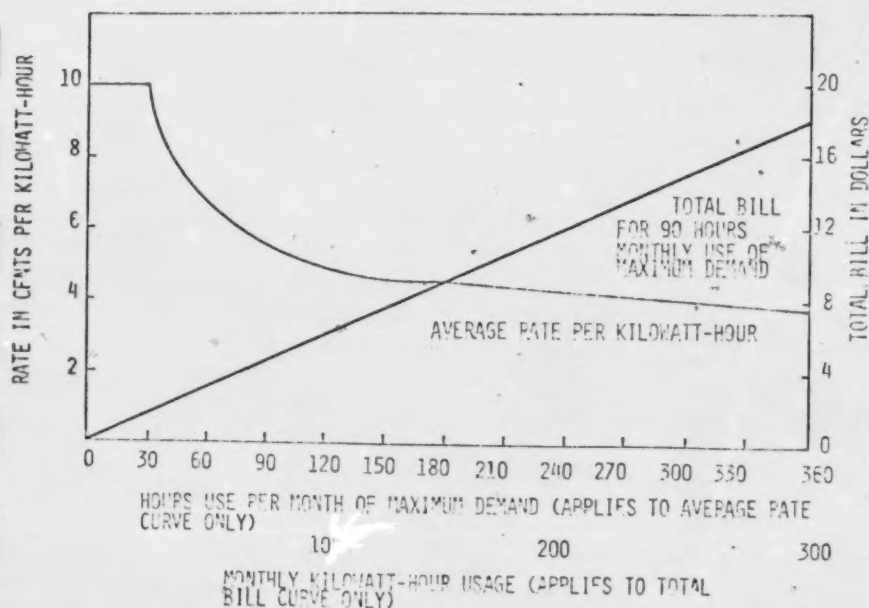
10¢ kwhr	1st	30 hrs use of demand
5¢ "	next	30 " " " "
3¢ "	excess	" " " "

Method of Figuring Bills

Assume a customer having a connected load of 875 watts and a demand, either estimated or measured, of 700 watts, 30 hours' use of 700 watts equals 21 kwhr, which is the fill amount to be charged for at 10¢ and 5¢. Assume monthly usage to be 55 kwhr, the bill would be

21	kwhr	X	10¢	=	\$2.10
21	"	X	5¢	=	1.05
13	"	X	3¢	=	.39
					<u>\$3.54</u>

FIGURE 2.4



3. Hopkinson Demand Rate

The term "Hopkinson Demand Rate" applies to that method of charge which consists of a Demand Charge, a sum based upon the demand either estimated or measured, or the connected load, plus an Energy Charge, a sum based upon the quantity of energy used. This method of charge was proposed by Dr. John Hopkinson in 1892.

Block Hopkinson Demand Rate

Either the Demand Charge or the Energy Charge, or both, in a Hopkinson demand rate, may be of the block form. Figure 2.5 shows this rate graphically:

Abbreviated:

Demand charge:

\$1.50 per KW 1st 25 KW of demand
\$1.25 " " excess

Energy charge:

5¢ kwhr 1st 100 kwhr
3¢ " next 400 "
2¢ " " 4,500 "
1¢ " excess

Method of Figuring Bills

Assume customer having demand of 30 KW and usage of 6,000 kwhr

Demand charge:

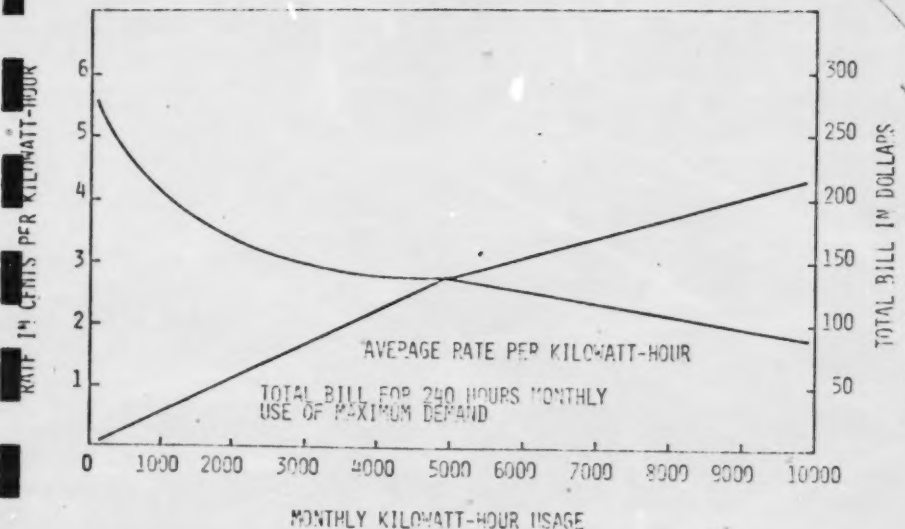
25 KW	X	\$1.50	=	\$37.50	
5 "	X	\$1.25	=	6.25	
30 "					\$ 43.75

Energy Charge:

100 kwhr	X	5¢	=	5.00	
400 "	X	3¢	=	12.00	
4,500 "	X	2¢	=	90.00	
1,000 "	X	1¢	=	10.00	
6,000 "					\$117.00
					<u>\$160.75</u>

Total Bill

FIG. 2.5. BLOCK HOPKINSON DEMAND RATE



4. Three Part or Three Charge Rate

Any of the foregoing types of rates may be modified by the addition of a Customer Charge. When such a charge is introduced in the Hopkinson Demand Rate, it becomes a "Three Part Rate," or "Three Charge Rate," which consists of a charge per customer or per meter; plus a Demand Charge, a sum based upon the demand either estimated or measured, or the connected load; plus an Energy Charge, a sum based upon the quantity of energy used. This rate may be expressed also in either the block or the step form. This method of charge was proposed by Mr. Henry L. Doherty in 1900. The following diagram shows this rate graphically:

Example:

Customer Charge

75 cents per month per meter

Plus a Demand charge of:

\$3.00 per month per kilowatt for the first 25 kilowatts of maximum demand in the month.

\$2.00 per month per kilowatt for the excess of the maximum demand over 25 kilowatts

Plus an Energy charge of:

6 cents per kilowatt-hour for the first 1,000 kilowatt-hours used per month.

3 cents per kilowatt-hour for the excess over 1,000 kilowatt-hours used per month.

Abbreviated:

Customer charge:

75 cents per month per meter

Demand Charge

\$3.00 per KW 1st 25 KW of demand
\$2.00 " " excess

Energy Charge:

6¢ per kwhr 1st 1,000
3¢ " " excess

Method of figuring bills assure customer having demand of 30 KW and usage of 4,000 kwhr.

Customer Charge

75 cents per month per meter. \$.75

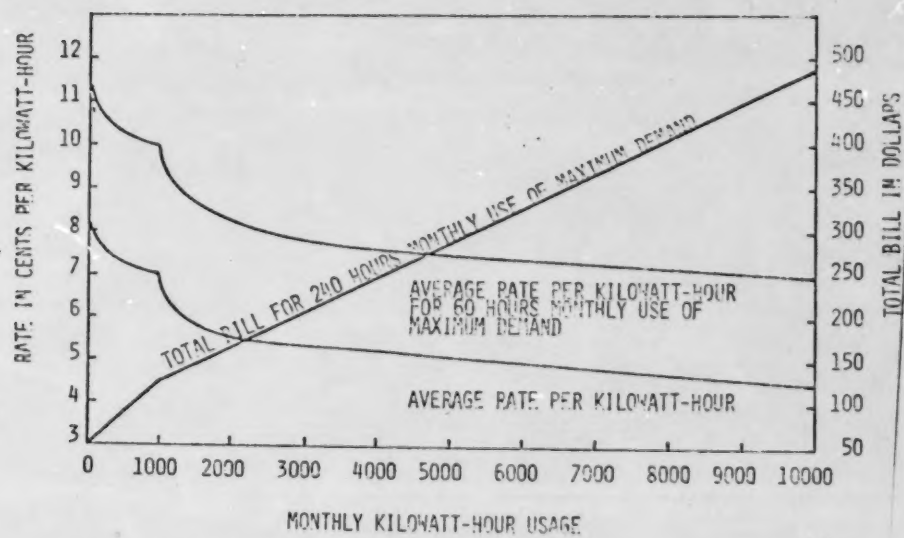
Demand charge

25	KW	X	\$3.00	=	\$75.00	
5	"	X	2.00		<u>10.00</u>	
30						\$85.00

Energy Charge:

1000	kwhr	X	6¢	\$60.00	
3000	"	X	3¢	<u>90.00</u>	
4000					150.00
14	20			Total	\$235.75

FIG. 2.6. DOWEITY OR THREE PART CHARGE DEMAND RATE



MODULE #3

UNDERSTANDING UTILITY BILLS

UNIT 3:

THE ELECTRIC BILL

OBJECTIVES: At the completion of this unit the student will be able to:

1. Read and understand the household electric bill.
2. Explain the meaning of each block listed on the bill and determine what type of billing is used.
3. Determine the amount of electricity used within a month and if it is billed correctly.
4. Utilize the bill as an energy conservation management tool.
5. Be familiar with the specific electric rates set by the Texas Power and Light Company for certain cities in Texas.

LECTURE

LABORATORY

UNIT 3:

THE ELECTRIC BILL

The amount of electrical energy used in a given period of time is recorded on an electrical bill directly from the meter readings. The rate for the service in the community is applied to the kilowatt-hour usage to arrive at the charge to the customer.

In order to understand the electric bill the Texas Power and Light company bill from Corsicana, Texas, will be used to illustrate the characteristics of a typical electric company bill. The electric bill issued in other parts of Texas or in other parts of the country may look different from this one, but the information listed will be similar. Below is a brief explanation of each block listed on the TP&L electric bill in Figure 3.1. This document can be a valuable instrument in energy management.

TEXAS POWER & LIGHT COMPANY
ELECTRIC BILL



TEXAS POWER & LIGHT COMPANY
A TAX-PAYING, INVESTOR-OWNED ELECTRIC UTILITY



ELECTRIC SERVICE BILL

ELECTRIC SERVICE BILL
TEXAS POWER & LIGHT COMPANY

FIGURE 3.1

PLEASE RETURN THIS PORTION WITH YOUR REMITTANCE

25) []

26) []

27) []

SERVICE ADDRESS		DATE	ACCOUNT NUMBER	DAY AND NIGHT APPL.
1) []	[]	2) []	3) []	16) []
[]		4) []	5) []	17) []
[]		6) []	7) []	18) []
[]		8) []	9) []	19) []
[]		10) []	11) []	20) []
[]		12) []	13) []	21) []
[]		14) []	15) []	22) []
[]		16) []	17) []	23) []
[]		18) []	19) []	24) []
[]		20) []	21) []	[]
[]		22) []	23) []	[]
[]		24) []	25) []	[]

PAY THIS AMOUNT

→

- 1) Service Address: This is the service address of the dwelling where electricity is being used.
- 2) Office: This numerical code identifies the specific electric service center or community office within the service district.
- 3) Account Number: The individual identification number for the particular account.
- 4) Present Kilowatt-hour Reading: The meter reading on the date indicated in block 6.
- 5) Estimate Indicator: If an "E" is printed in this box the reading in box 4 is an estimate and not an actual reading because of a barrier prohibiting the meter reader from reading the meter.
- 6) Present Reading Date: The date upon which the reading in box 4 was taken.
- 7) Previous KWH Reading: The meter reading at the end of the previous billing period.
- 8) Previous Reading Date: The date upon which the reading in box 7 was taken.
- 9) KWH Multiple: This indicates the gear ratio of the meter. If the meter has 10X printed on it, a 10 will appear in this block. On some commercial meters the amount of electricity is so great that the meter dials must be stepped down in order not to wear out the meter. The gear ratio then must be indicated as a multiplier.
- 10) Current KWH: Electricity used (number of kilowatt hours) in the current billing period.
- 11) Base Amount Excluding Fuel Cost: Cost of the amount of electricity used, measured in KWH, before the Fuel Cost Adjustment, other amounts and taxes are added.

(12) Fuel Cost per KWH: Current electricity cost adjustment rate in effect for the community. This fluctuates monthly.

(13) Fuel Cost: Fuel Cost Adjustment Rate multiplied by total KWH used during the current billing period.

(14) Other KWH: This block is used to indicate the amount of KWH which are not linked to the meter. If the customer has an outside guard-lite, this block will have 68 printed in it. These KWH are not metered nor figured into the Base Amount in Block 11. The "68" figure is used, however, as an additional multiplier for fuel cost adjustment in block 13.

(15) Sales Tax: State and city (if applicable) sales tax amount, based on the billing amounts. At present the State of Texas does not charge a sales tax on utilities. Cities, however, have the option of charging a 1% sales tax which would appear here if applicable.

(16) Deposit and/or Interest Applied: Amount of interest accrued from customers deposit or the amount of initial service deposit credited toward the termination bill.

(17) Miscellaneous: Used to list installation charges, service charges, and other costs to the customer not covered in other blocks on the bill.

(18) Guard-lite: The fixed monthly fee charged for an unmetered guard-lite. Presently in Texas this is \$6.35 per month. (See Unit 3B of this module for guard-lite rate schedule and service agreement).

(19) Total Current Month Bill: This is the total charges for the month minus any applicable credits in block 16.

(20) Rate Code: This is a numerical code which refers to the rate charged to the customer. It is not a monetary figure.

(21) Past Due After: This is the date the bill is due.

(22) Balance: Amount due from previous months' bill.

(23) Total Due: Total amount due for electrical service for the month.

(24) Name: The customer's last name and first initial.

(25) Office: Same as block #2.

(26) Account Number: Same as block #3.

(27) Total Due: Same as block #21.

The same bill form is used for customers with rate meters and demand meters. Those customers with demand meters will have blocks A.B.C. and D completed.

(A) Present Kilowatt Reading: The kilowatt supplied to the customer during the 15-minute period of maximum use during the current month, as determined by the company's demand meter.

(B) Kilowatt Multiplier: This indicates the gear ratio of the meter. If the meter has 10X printed on it, a 10 will appear in this block. On some commercial meters the amount of electricity is so great that the meter must be stepped down in order not to wear the meter. The gear ratio then must be indicated as a multiplier.

(C) Metered Kilowatt: The number used as a multiplier for the peak kilowatt demand period during the month. It will not be less than 4.

(d) Billed Kilowatt: This is the kilowatt demand multiplier used to determine the present billing charge. If block A is less than 4, block C will reflect a minimum number of 4 regardless of the demand for the month. Block D is not less than 70% of the maximum kw determined during the billing months of June, July, August, September, or October in the 12 months ending with the current month, but not less than 4 kw.

B. Texas Power and Light Rate Schedule.

For purposes of illustration, three rate schedules filed by the Texas Power and Light should be discussed. The first schedule is for residential service in Corsicana, Texas, serviced with rate meters. The rate code 101001 printed in block #20 of the TP&L electric bill refers to the residential service rate schedule in Figure 3.2

FIGURE 3.2

TEXAS POWER AND LIGHT COMPANY RESIDENTIAL AND COMMERCIAL RATE SCHEDULE

APPLICATION:

Applicable to any customer for all electric service used for residential purposes in an individual private dwelling or an individually-metered apartment, supplied at one point of delivery and measured through one meter.

Not applicable to reefer or breakdown service in any event, nor to temporary, standby, or supplementary service except in conjunction with applicable rider.

NET MONTHLY RATE*

Billing Months of November
Thru April

\$5.00 which includes the
use of 30 kwh
\$2.03¢ per kwh for all
additional kwh

Minimum: \$5.00

Billing Months of May
Thru October

\$5.00 which includes the
use of 30 kwh
\$2.77¢ per kwh for all
additional kwh

*Company reserves the right to read meters at other than monthly intervals, and to bill customers on the basis of proportionate changes in the length of the blocks of the rate schedule.

Plus a charge per kwh of energy taken for fuel cost calculated in accordance with approved schedules. (This amount varies monthly. Historically it is between \$.005 per kilowatt hour).

TYPE OF SERVICE

Company will supply single-phase service (or three-phase service if available at the point of delivery) at 60 cycles and at any standard voltages available from Company's distribution system through one standard transformation. Where service of the type desired by the Customer is not already available at the point of service, special contract arrangements between the Company and the Customer may be required prior to its being furnished.

PAYMENT

Bills are due when rendered, and become past due if not paid within fifteen days thereafter. Service to customers having past due bills may be discontinued as provided in Company's Service Regulations, and an additional charge of not less than \$7.50 will be made before service is restored.

CONTRACT PERIOD

As provided for in the Agreement for Service.

NOTICE

This established schedule is subject to any change authorized by law, and to the provision of Company's Service Regulations.

Figure 3.3 is the rate schedule and service agreement filed by TP&L governing residential use of a guard-lite for Corsicana, Texas. Block #14 and #18 of the bill reflect the conditions of this rate schedule.

FIGURE 3.3

TEXAS POWER AND LIGHT COMPANY

OUTDOOR LIGHTING RATE

APPLICATION:

Applicable to any customer in areas designated by Company for unmetered lighting service supplied exclusively to one or more outdoor type 175-watt white mercury vapor lamps operating automatically every night from dusk to dawn.

NET MONTHLY RATE

\$6.35 Per Lamp

Plus a charge per kwh of energy taken for fuel cost calculated in accordance with Schedule FCP.

INSTALLATION AND MAINTENANCE OF FACILITIES

Company will install, own and maintain at its own cost and expense at each lamp location, one mercury vapor luminaire complete with one 175-watt white mercury vapor lamp, lamp ballast, lamp operating equipment and an upsweep bracket on an existing Company-owned wooden pole or, at Customer's option, on an additional 30-foot wooden pole to be installed and maintained by company at an agreed-upon location not to exceed a distance of 125 feet from Company's existing secondary distribution lines or from any other lamp location served hereunder.

Company will, at its own cost and expense, replace all burned-out lamps. All expenses covering replacement of lamps and glass refractors due to vandalism or other breakage shall be borne by Customer.

DETERMINATION OF ELECTRIC ENERGY

Electric energy supplied in the operation of this lamp will be estimated at the rate of 68 kwh per lamp per month.

PAYMENT

Bills are due when rendered, and become past due if not paid within fifteen days thereafter. Service to customer's having past due bills may be discontinued as provided in Company's Service Regulations, and an additional charge of not less than \$7.50 will be made before service is restored.

CONTRACT PERIOD

As provided for in the Agreement for Services, but not less than 24 months.

NOTICE

This established schedule is subject to any change authorized by law, and to the provisions of the Company's Service Regulations.

Figure 3.4 is the general service rate schedule for small businesses and institutions regulated by demand meters. This schedule is on file at the Texas Power and Light company in Corsicana, Texas, and is subject to change.

FIGURE 3.4

TEXAS POWER AND LIGHT COMPANY
GENERAL SERVICE (SMALL) - SCHEDULE GS

APPLICATION:

Applicable to any customer for all electric service supplied at one point of delivery and measured through one meter.

Not applicable to resale or breakdown service in any event, nor to temporary, standby, or supplementary service except in conjunction with applicable rider.

NET MONTHLY RATE*

\$6.00 which includes the use of	30 kwh
6.40 per kwh next	270 kwh
3.80 per kwh next	700 kwh
2.75 per kwh next	1000 kwh
1.65 per kwh next	4500 kwh
1.20 per kwh for all additional kwh	

For each kw of demand in excess of 4, add 205 kwh to the 6.40 block

- Minimum: (a) Single-phase - \$6.00
(b) Three-phase - \$6.00 plus \$0.45 for each kw of demand in excess of 4.

*Company reserves the right to read meters at other than monthly intervals, and to bill customers on the basis of proportionate charges in the length of the blocks of the rate schedule.

Plus a charge per kwh of energy taken for fuel cost calculated in accordance with approved schedules. (This amount varies monthly. Historically it lies between \$.005 and \$.015 per kilowatt hour).

DETERMINATION OF DEMAND

The Demand shall be the kw supplied during the 15-minute period of maximum use during the current month, as determined by company's demand meter, but not less than 70% of the maximum kw similarly determined during the billing months of June, July, August, September, or October in the 12 months ending with the current month, nor less than 4 kw.

TYPE OF SERVICE

Company will supply single-phase service (or three-phase service if available at the point of delivery) at 60 cycles and at any standard voltages available from Company's distribution system through one standard transformation. Where service of the type desired by the Customer is not already available at the point of service, special contract arrangements between the company and the customer may be required prior to its being furnished.

PAYMENT

Bills are due when rendered, and become past due if not paid within fifteen days thereafter. Service to customers having past due bills may be discontinued as provided in Company's Service Regulations, and an additional charge of not less than \$7.50 will be made before service is restored.

CONTRACT PERIOD

As provided for in the Agreement for Service.

NOTICE

This established schedule is subject to any change authorized by law, and to the provisions of Company's Service Regulations.

MODULE #3

UNDERSTANDING UTILITY BILLS

UNIT 4:

GAS METERS AND GAS RATES

OBJECTIVES: At the completion of this unit the student will be able to:

1. Understand how a gas meter works.
2. Read a gas meter.
3. Understand the various types of gas rates available to gas companies.
4. Compute gas costs using any of the eight types of rate schedules discussed.

LECTURE

LABORATORY

UNIT 4

Gas Meters and Gas Rates

A. Gas Meter

Natural gas is delivered to the home through underground lines. A gas meter is installed between the source and the home and measures the volume of natural gas used in cubic feet (CCF). It is a finely tuned instrument calibrated for accuracy. Therefore, the amount of gas used as indicated on the meter or the gas bill is exactly the amount which passed from the main gas supply to the appliances in the home.

The meter itself is relatively simple in design (Figure 4.1). There are four chambers which fill and empty with gas alternately. When the gas is turned on at the appliance the pressure drops slightly in the gas "outlet" line which runs from the meter to the appliance. The pressure in the "inlet" line going into the meter from the supply remains high. This causes an unbalanced pressure in the meter which pushes on a movable diaphragm or bellows A and makes it expand like an accordion. Gas flows.

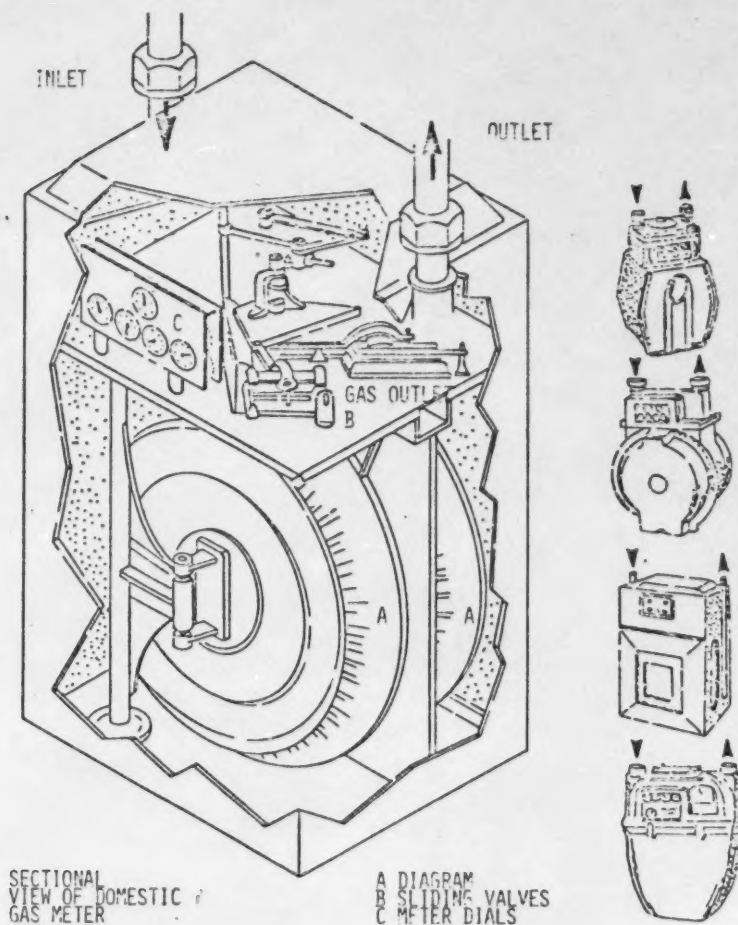
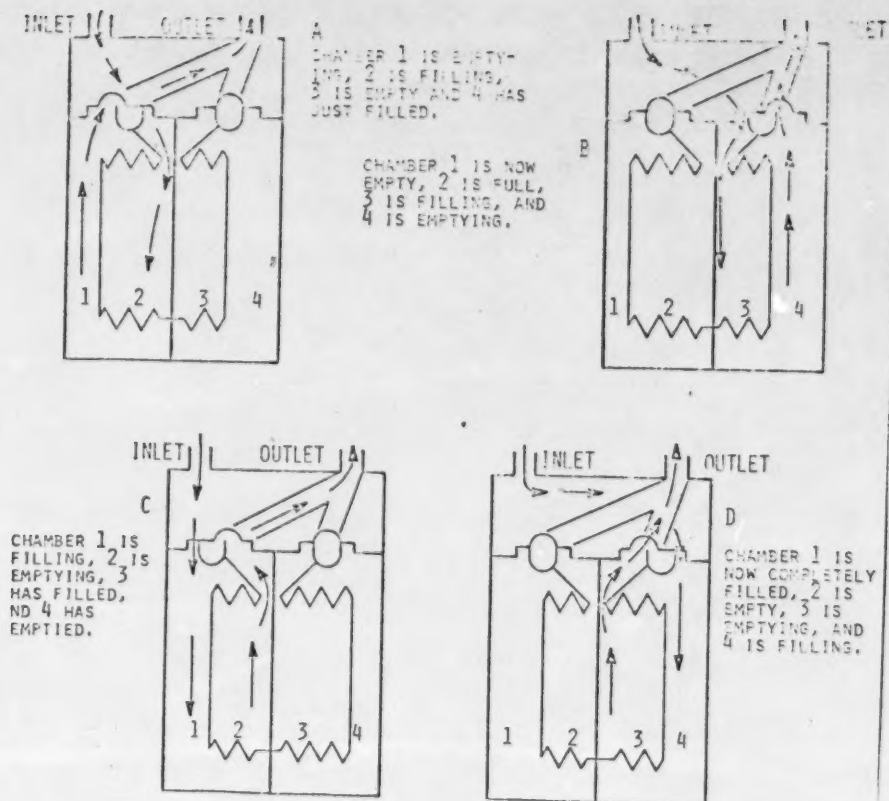


FIG. 4.1. HOW YOUR GAS METER WORKS

The flow of gas into and out of the four separate chambers in the meter is controlled by sliding valves B so that the gas output is smooth and steady. Each chamber is filled with the same volume of gas every time. Figure 4.2 explains in detail how the sliding valves control the gas flow.)

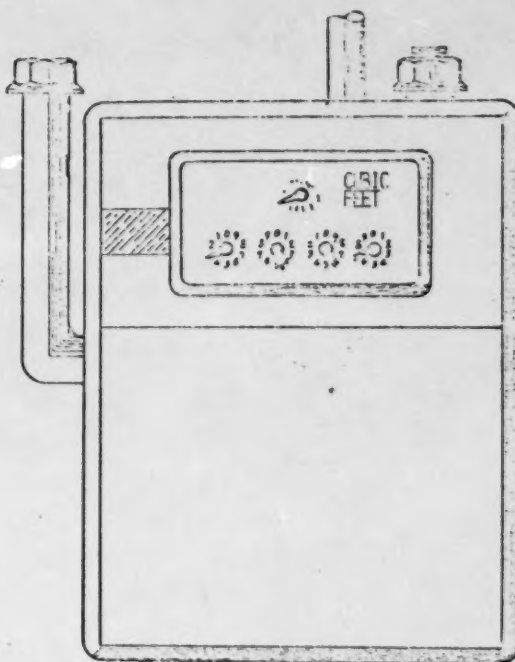
The meter dials C on the face keep count of the number of times the chambers are filled and emptied. Thus the volume of gas that passes through the meter is recorded. As long as home appliances are using gas in the home there is an unbalanced pressure in the meter, and the meter operates.

FIG. 4.2. HERE'S HOW SLIDING VALVES CONTROL THE GAS FLOW



There are five dials on the meter face (Figure 4.3). The smallest dial which sits above the four in a row is a test dial and indicates the meter is operating and gas is flowing. When reading the amount of gas used the remaining four dials are used.

FIG. 4.3. HOW TO READ YOUR GAS METER



The dials are organized much the same way as the dials on an electric meter. Note that the smallest quantity of gas measured by most meters is 100 cubic feet (CCF). The markings on the rightmost dial A represents 100 cubic-feet; thus, the rightmost needle goes around once for every 1000 cubic-feet of gas consumed. Some of the dials rotate clockwise and some rotate counter-clockwise. Since the gas meter measures a cumulative total, the four dials must be read together.

On Figure 4.3, start with the dial at the left and read the number the hand has just passed. When a hand is between numbers, always read the smaller number. The reading for the meter pictured in Figure 4.3 is 3457. Therefore the amount of gas used is 3457 Hundred Cubic Feet or 3457 CCF.

Gas Meters and Gas Rates

Dial A	measures	gas	in	1,000's	CCF
Dial B	"	"	"	10,000's	CCF
Dial C	"	"	"	100,000's	CCF
Dial D	"	"	"	1,000,000	CCF

B. Gas Rates:

Gas rates are set similarly to electric rates. The unit of use, or hundred cubic feet (CCF), read on the meter is the indicator upon which the rate is set and the bill is issued. There are several ways of figuring a gas utility rate.

(1) Straight Line Rate

Under this type of rate the price of gas per thousand cubic feet is constant, regardless of consumption.

Example: Rate - \$1.50 per M (for all gas used)

(2) Step Rate

Under this type of rate a specified price per MCF is paid for the entire amount of gas consumed during a given month, and the rate charged depends upon the "step" in which the total consumption falls.

Example:

Monthly Consumption Cu. ft.	Enter Consumption Billed Per M at
Under 5,000	\$1.50
5,000-10,000	1.25
Over 10,000	1.00

(3) Block Rate

Under this rate a constant price per MCF is charged for all gas consumed in the first "block" and a lower price per MCF is charged for all gas consumed in succeeding blocks.

Example:

Cu. Ft.	Per M
First 2,000	\$1.40
Next 3,000	1.20
Next 5,000	1.00
All additional	.90

Straight Line Rate

Problem:

Assume monthly consumption of 5,000 cubic feet.

Bill = 5,000 cu.ft. @ \$2.50 per M = \$7.50.

Step Rate

Problem:

Assume monthly consumption of 2,000 cubic feet.

Bill = 2,000 cu.ft. @ \$1.50 per M = \$3.00.

Assume monthly consumption of 8,000 cubic feet.

Bill = 8,000 cu.ft. @ \$1.25 per M = \$10.00.

Block Rate

Problem:

Assume monthly consumption of 16,000 cu.ft.

Bill is computed as follows:

First	2,000 cu.ft.	@ \$1.40 per M	\$2.80
Next	3,000 " "	" \$1.20 " "	3.60
Remain-	6,000 " "	" \$1.00 " "	5.00
ing		Total Bill	\$16.80
		Average price of gas per MCF	1.05

(4) Block Rate with Small Initial Block which Constitutes Minimum Monthly Bill-

This is a very common type of rate, and is best illustrated by the following example:

First 500 cu.ft. or less	\$1.25
Cu. Ft.	Per M
Next 1,500	1.05
Next 3,000	.90

For the above rate the minimum monthly bill is \$1.25, which entitles customer to use 500 cu.ft. of gas. If monthly consumption is less than 500 cu. ft. the charge is still \$1.25.

(5) Service Charge Rate with Straight Line Consumption Charge-

Under this type of rate, the total bill is obtained by adding the service charge to the charge for gas consumed. The consumption charge per MCF used is constant but the average price of gas per MCF decreases as consumption increases due to spreading of the service charge over a larger consumption.

Example:

Service Charge	\$1.00 per month
	.90 per M

Note: Many rates of the service charge type have a block or other type of consumption charge, instead of a straight line consumption charge.

(6) Flat Rate

Under this type of rate, there is a flat monthly charge depending upon some factor, such as the capacity or hourly demand of gas burning equipment, installed on the customer's premises. This type of rate is sometimes used for gas refrigeration or water heating.

Example:

For all gas used in operating a water heater with a demand of 7 cu.ft. per hour, a flat charge of \$2.00 per month. For all gas used in operating a gas refrigerator with a demand of 2 cu. ft. per hour, a flat charge of \$1.30 per month.

Block Rate and Small Initial. Block which constitutes minimum monthly bill.

Problem:

Assume a monthly consumption of 12,000 cubic feet.

Bill is computed as follows:

First	500 cu.ft.	\$1.25
Next	1,500 cu.ft. @ \$1.20 per M	1.80
Next	3,000 cu.ft. @ 1.05 per M	3.15
Remain-	7,000 cu.ft. @ .90 per M	6.30
ing	Total bill	\$12.50

Average price of gas per MCF \$ 1.04

Problem

Assume monthly consumption of 5,000 cu.ft.

Bill is computed as follows:

Service charge	\$1.00
Consumption charge-	
5,000 cu.ft. @ \$.90 per M	4.50
Total bill	\$5.50
Average price of gas per MCF	1.10

(7) Wright Demand Rate

This type of rate takes in account the customer's load factor. The load factor is the ratio of the average hourly consumption to the maximum hourly consumption (or the maximum hourly demand) of the customer's installation. As the customer's consumption increases without an increase in maximum demand, his/her load factor increases and the cost of gas per MCF decreases.

Example:

Hours of demand	Per C
First 20	\$.13
Next 30	.11
All additional	.09

(8) Two-Part Rate

This type of rate consists of two parts---a demand charge and a commodity charge

The demand charge is based on the maximum demand of the customer's installation. The commodity charge is based on the amount of gas consumed during the month.

The customer's bill is the sum of the demand and commodity charges.

There are many forms for the demand and commodity charges in this type of rate.

The demand charge may be

- (1) A flat amount per month.
- (2) A constant amount per unit of demand regardless of the total demand.
- (3) A block type in which the charge per unit of demand is reduced as the demand increases.
- (4) Various other forms.

Problem

For a customer with a maximum demand of 80 cu.ft. and a monthly consumption of 7,000 cu.ft. bill is computed as follows:

First 20X80=1,600 cu.ft.@\$.13	
per C	\$2.08
Next 30X80=2,400 cu.ft.@\$.11	
per C	2.54
Remainder 3,000 cu.ft.@\$.09	
per C	2.70
Total bill	<u>\$7.32</u>
Average price of gas per MCF	\$1.05

The common charge may be:

(1) Straight line type in which the charge per MCF consumed is constant.

(2) Block type in which the charge per MCF decreases as the consumption increases.

(3) Wright demand type in which the charge per MCF decreases as the customer's load factor increases.

(4) Various other forms.

The demand charge may be based on:

(1) The maximum rate of use of gas for a given interval. The interval may be one hour, 24 hours or one month. The maximum demand may be measured or estimated.

(2) The capacity (manufacturer's rating) of gas burning equipment in the customer's installation.

(3) In two part house heating rates the demand charge is usually based on one of the following: (a) the amount of cast iron radiation surface required (or its equivalent). (b) the capacity of gas burning equipment. (c) the cubical content, exposed surface and window area of the building to be heated (the heat loss from the building and hence the maximum gas demand is roughly proportional to these items).

Example

Demand Charge Per month (Based on maximum 1-hour demand)

Cu.Ft.	Per C
First 100	\$10.00
Next 200	8.00
All additional	6.00

Commodity Charge

Cu.Ft.	Per C
First 50,000	\$.08
Next 100,000	.07
All additional	.06

Problem

Assume that the customer's maximum hourly demand is 700 cu.ft. and that the customer uses 400,000 cu.ft. of gas per month. Bill is computed as follows:

Demand Charge

First 100 cu.ft.of demand @ \$10.	
Per C	\$10.00
Next 200 cu.ft.of demand @ \$ 8.	
Per C	16.00
Remaining 400 cu.ft.of demand @ 6.00 per C	24.00
Total Demand Charge	\$50.00

Commodity Charge

First 50,000 cu.ft.@ \$.08 Per C	\$40.00
Next 100,000 cu.ft.@ \$.07 Per C	70.00
Remaining 250,000 cu.ft. @ \$.06 Per C	150.00
Total Commodity charge	\$260.00
Total bill=\$50.00+\$260.00	\$310.00

Average price of gas per MCF \$.78

(9) Three Part Rate

This type of rate consists of three parts--a customer charge, demand charge, and commodity charge.

The customer charge is usually a flat charge per month or per year (payable in equal monthly installments). The demand and commodity charges are of the same type as given under "Two Part Rates." The customer's bill is the sum of the three charges.

Example

Customer Charge--\$1.00 per month

Demand charge

First 200 cu.ft. of demand

\$.05 per cu.ft.

All additional cu.ft. of demand

\$.03 per cu.ft.

Commodity Charge

First 25,000 cu.ft.

\$.95 per M

All additional

\$.85 per M

Assume the customer's maximum one hour demand to be 250 cubic feet and monthly gas consumption to be 100,000 cubic feet.

Bill is computed as follows:

Customer Charge	\$ 1.00
-----------------	---------

Demand Charge	
---------------	--

Demand Charge	
---------------	--

First	200 cu.ft. @ \$.05	
	per cu. ft.	\$10.00

Remaining	50 cu.ft. @ .03	
	per cu.ft.	\$ 1.50

Total demand charge	\$11.50
---------------------	---------

Commodity Charge	
------------------	--

First	25,000 cu.ft.	
	@ \$.95 per M =	\$23.75

Remaining	75,000 cu.ft.	
	@ \$.85 Per M =	\$63.75

Total commodity charge	\$87.50
------------------------	---------

Total bill after discount

\$1.00 + \$11.50 + \$87.50 = \$100.00

Average price of gas

per MCF = \$ 1.00

MODULE #3

UNDERSTANDING UTILITY BILLS

UNIT 5:

THE GAS BILL

OBJECTIVES: At the completion of this unit the student will be able to:

1. Read a gas bill and appreciate the information it gives.

2. Be familiar with the Lone Star Gas Company rate schedule for various cities in Texas.

LECTURE

UNIT 5:

LABORATORY

The Gas Bill

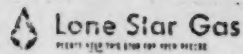
The amount of gas used in a given period of time is recorded on a gas bill directly from the meter reading. The rate for the service in the community is applied to the hundred cubic feet (CCF) of usage to arrive at the charge to the customer.

A. Lone Star Gas Bill

In order to understand the gas bill, the Lone Star Gas Company bill from Corsicana, Texas, will be used to illustrate the characteristics of a typical gas company bill. The gas bill used in other parts of Texas or in other parts of the country may look different from this one, but the information listed will be similar.

Below is a brief explanation of each block listed on the Lone Star gas bill at Figure 5.1 which must be understood in order for the bill to be a viable instrument for energy management.

FIGURE 3.1
TEXAS LONE STAR GAS COMPANY
GAS BILL



Lone Star Gas Company
PLEASE RETURN THIS PORTION WITH YOUR PAYMENT

1) SERVICE ADDRESS		20) _____	
2) ACCOUNT NUMBER	3) RATE CODE	19) _____	
4) CURRENT READING	5) DATE	16) _____	
6) CREDIT	7) DEPOSIT AND/OR INTEREST	17) _____	
8) ESTIMATED READING	9) FINAL BILL	18) _____	
10) OTHER CHARGES	11) SPECIAL AIR COND RATE	12) METER EXCHANGE	
13) BILLING EXPLANATION	14) CREDIT	15) _____	

SEE BACK OF BILL FOR CODE EXPLANATION

- 21) CODE EXPLANATION
- A. APPLIANCE SERVICE
 - B. CREDIT CHANGE
 - C. CREDIT
 - D. DEPOSIT AND/OR INTEREST APPLIED
 - E. ESTIMATED READING
 - F. FINAL BILL
 - G. OTHER CHARGES
 - H. SPECIAL AIR COND RATE
 - I. METER EXCHANGE
- BILLING EXPLANATION
- CCF = HUNDREDS OF CUBIC FEET
- ALL ARE INCLUDED AN ADJUSTMENT FOR THE INCREASE OR DECREASE IN THE PRICE THE COMPANY MUST PAY FOR NATURAL GAS INDICATED FOR OUR CUSTOMERS THE ADJUSTMENT FOR CHANGE IN GAS COST HAS BEEN APPROVED BY THE REGULATORY AUTHORITY IN THE JURISDICTION OF YOUR SERVICE AREA.

(1) For Your Service At: This is the service address of the dwelling where gas is being used.

(2) Account Number: The individual identification number for the particular account.

(3) Rate Code: This three digit code represents the rate in effect in the community.

(4) Current Reading and Date: The meter reading on the date indicated. If an "E" is printed in the box below the asterisk, the reading was an estimate and not an actual reading due to a locked gate, dog, obstruction of meter, or other barriers prohibiting the meter reader from reading the meter.

(5) Previous Reading and Date: The meter reading at the end of the previous billing period. Subtract this figure from Current Reading and Date to determine how much gas (number of CCF) used. (See note in #4 for a code of "E")

(6) CCF Consumption: Gas used (number of CCF) in the current billing period.

(7) Days Service: The number of days from Previous Date to Current Date.

(8) Base Cost of Gas Service: Cost of the amount of gas used, measured in CCF, before the Gas Cost Adjustment, other amounts and taxes are added.

(9) Previous Balance: Amount unpaid from previous billing period.

(10) Gas Cost Adjustment Rate/CCF: Current gas cost adjustment rate in effect for the community. One CCF=100 cubic feet of gas.

(11) Gas Cost Adjustment (GCA) Amount: GCA Rate multiplied by total gas (number of CCF) used during the current billing period.

(12) Other Amounts and/or Codes: Amount of special service charges due Lone Star Gas. The specific service will be preceded by a code letter from the back of the card. Code Explanation:

- A. Appliance Service
- B. Connect Charge
- C. Credit
- D. Deposit and/or interest paid on the customer's installation deposit is often credited to the bill.
- G. Other Charges
- M. Meter Exchange

(13) Sales Tax: State and city (if applicable) sales tax amount, based on the billing amounts. At present the State of Texas does not charge a sales tax on utilities. Cities, however, have the option of charging a 1% sales tax which would appear here, if applicable.

(14) Total Gross Amount: Includes Gross Cost of Gas Service, GCA, Other Amounts and Sales Tax.

(15) Total Net Amount: Amount due if paid promptly. Prompt payment rates are not included in city ordinances in some communities.

(16) Discount Date: Last date to pay Net Amount due before Gross Amount becomes due.

(17) Gross Amount: Same as #14 above.

(18) Net Amount: Same as #15 above.

(19) Name and Address: Name and street address to whom bill is sent.

(20) Office Identification: The numerical identification of the Lone Star Gas Company Office.

(21) Code Explanation: On reverse side of card is an explanation of the letter codes used in various blocks on the front of the bill. where applicable.

A. Appliance Service--Applies to servicing of company owned appliances used by the customer, such as gas outside lights, grills, etc.

B. Connect Charge--Charge for connecting or reconnecting gas meter and service to the home.

C. Credit--amount due to customer for overpayment.

D. Deposit and/or Interest Applied--amount of interest accrued from customers deposit or the amount of initial service deposit credited toward termination bill.

E. Estimated Reading--estimate of amount of gas used instead of actual meter reading due to locked gate, dog, or other barriers prohibiting meter reader from reading meter.

F. Final Bill--indication of termination of service bill.

G. Other Charges--miscellaneous code for various charges.

H. Special Air Conditioning Rate--indication of a special rate negotiated for the customer because of special air conditioning.

I. Meter Exchange--charge for changing a broken or malfunctioning meter with a new one.

B. Lone Star Gas Rate Schedule

The rate schedule for residential and commercial use of gas in the state of Texas is regulated by the Railroad Commission. Figure 5.2 is an excerpt from the rate schedule for Corsicana, Texas, filed by the Lone Star Gas Company at the Texas Railroad Commission.

FIGURE 5.2

LONE STAR GAS COMPANY

RESIDENTIAL AND COMMERCIAL RATE SCHEDULE

MONTHLY RATE:

First 1000 Cu.Ft. or Fraction Thereof \$2.4444 Gross; \$2.2000 Net.
Over 1000 Cu.Ft. @ \$1.5639 Per MCF Gross; \$1.4075 Per MCF Net.

No gas bill will be rendered to any residential or commercial consumer served under the above rate not consuming any gas during any monthly billing period, except that where customer's only use for gas service is in an outdoor grill and/or a fireplace starter, the amount shown for the first consumption block shall constitute a minimum monthly bill.

PROMPT PAYMENT PROVISION:

Net rate shall apply to all bills paid within ten days from monthly billing date. Thereafter, gross rate shall apply.

BILLING ADJUSTMENTS:

The following adjustment is applicable if letter "T" follows town name below.

The amount of each net monthly bill computed at the above stated rates shall be subject to the following adjustment: Plus an amount equivalent to the proportionate part of any new tax, or increased rate of tax, or governmental imposition or charge (except state, county, city, and special district ad valorem taxes and any taxes on net income) levied or assessed against the Company or on its gas business, as the result of any new or amended law, ordinance or contract, after July 1, 1975. Each gross monthly bill shall be adjusted proportionately.

The following adjustment is applicable if letter "G" follows town name below.

The amount of each net monthly bill computed at the above stated rates shall be subject to the following adjustment: Plus or minus the amount of any increase or decrease, respectively, above or below the \$1.0399 per Mcf level in the intracompany city gate charge as authorized by the Railroad Commission of the State of Texas or other regulatory body having jurisdiction for gas delivered to Lone Star Gas Company's distribution system for sale to residential and commercial consumers where such changes are caused by increases or decreases in the cost of gas purchased by the Company. Each gross monthly bill shall be adjusted proportionately. (The GCA for Corsicana, Texas, varies per monthly. Historically it has been between \$2.50 and \$1.50 CCF).

BILLING PERIOD:

The above rate schedule is applicable to each residential and commercial consumer per month or for any part of month for which gas is used at the same location.

(CORSICANA-TG)

MODULE #9
UNDERSTANDING UTILITY BILLS

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FIG. 1.1. DIAGRAM OF A WATTMETER

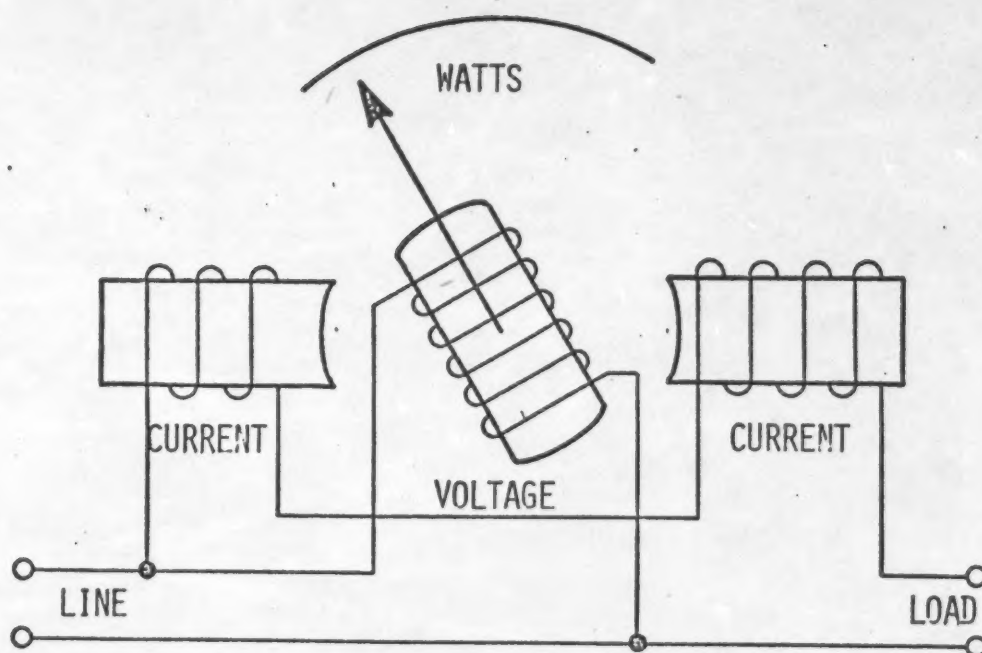
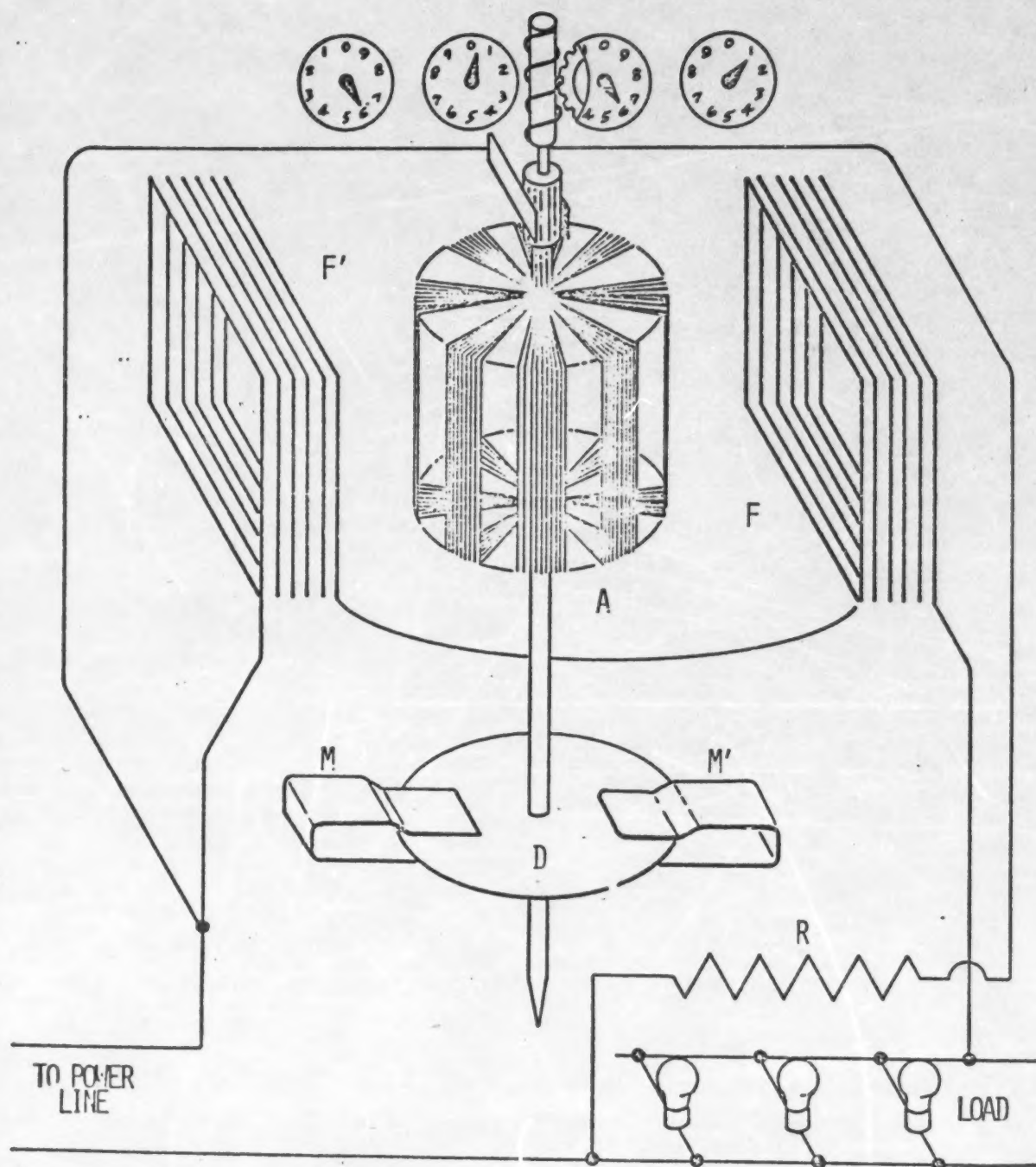


FIG. 1.2. A WATT-HOUR METER



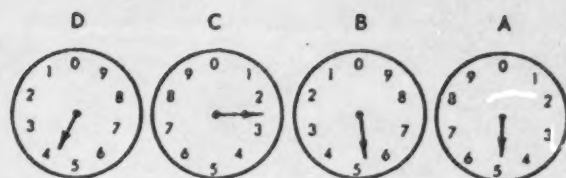


FIGURE 1.3 THE DIALS OF THE WATT-HOUR METER

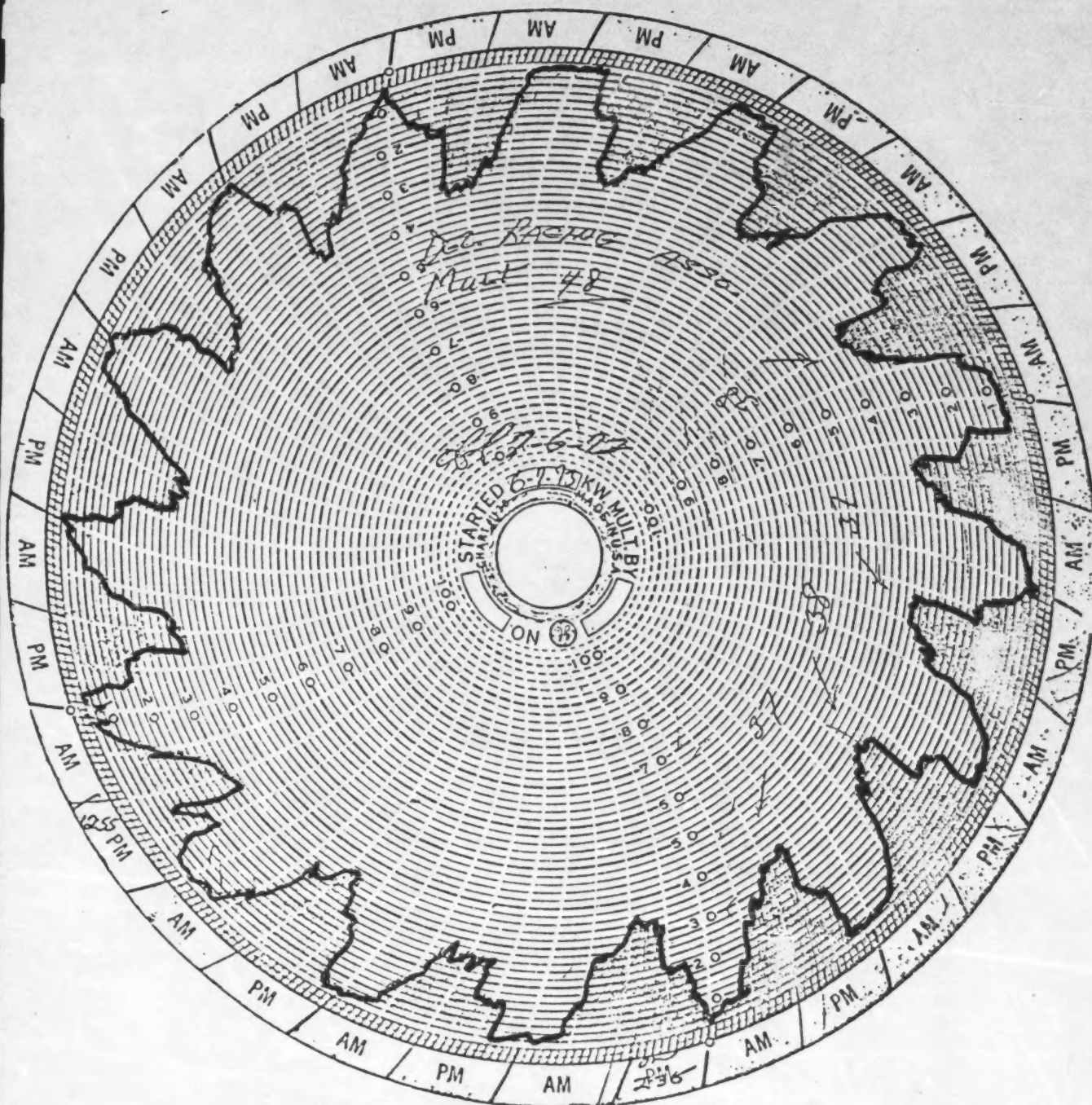


FIGURE 1.4

ELECTRIC DEMAND METER READING

FIG. 2.1. STRAIGHT LINE METER RATE

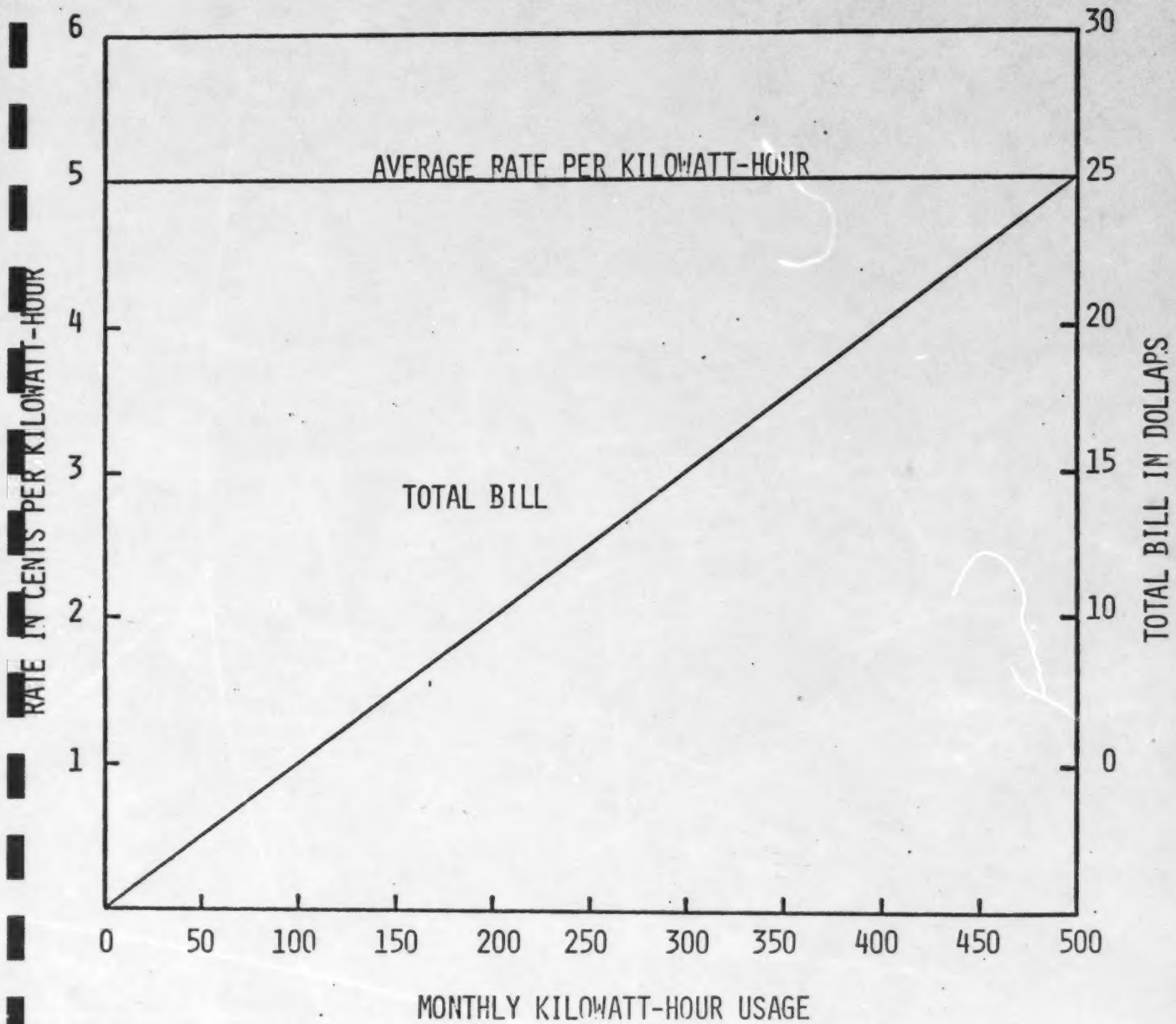


FIG. 2.2. STEP METER RATE.

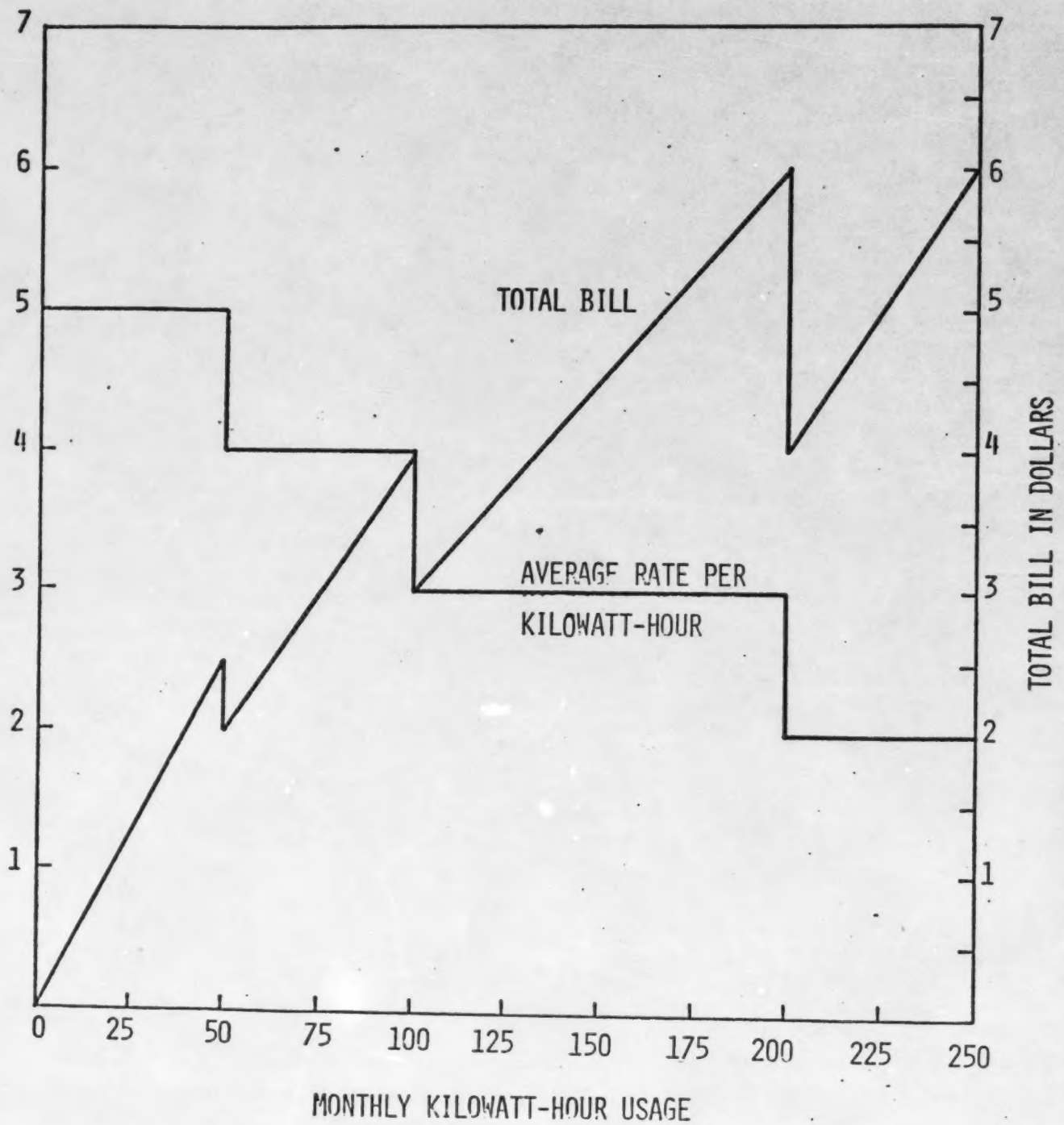


FIG. 2.3. BLOCK METER RATE

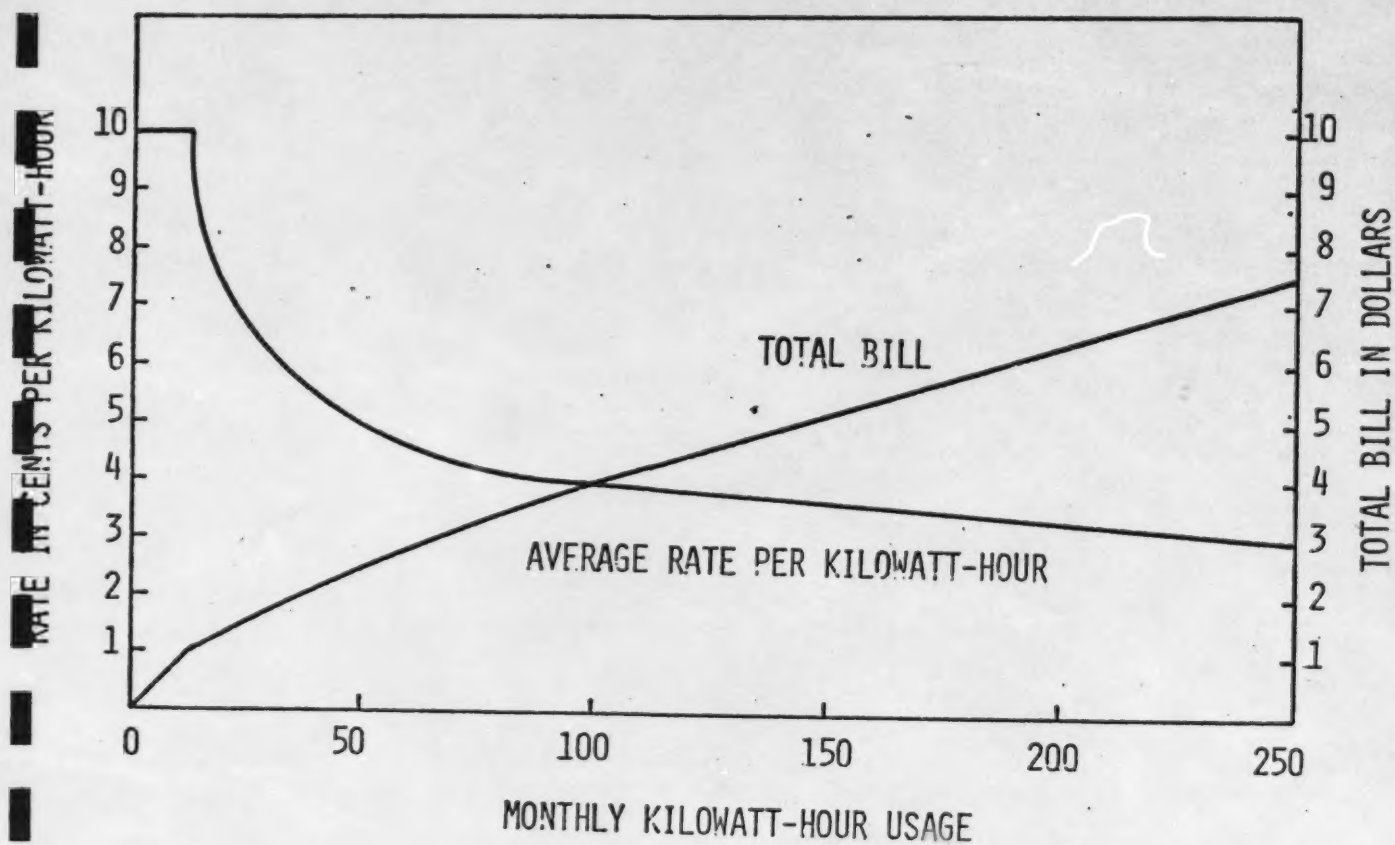


Fig. 2.4.

WRIGHT DEMAND RATE

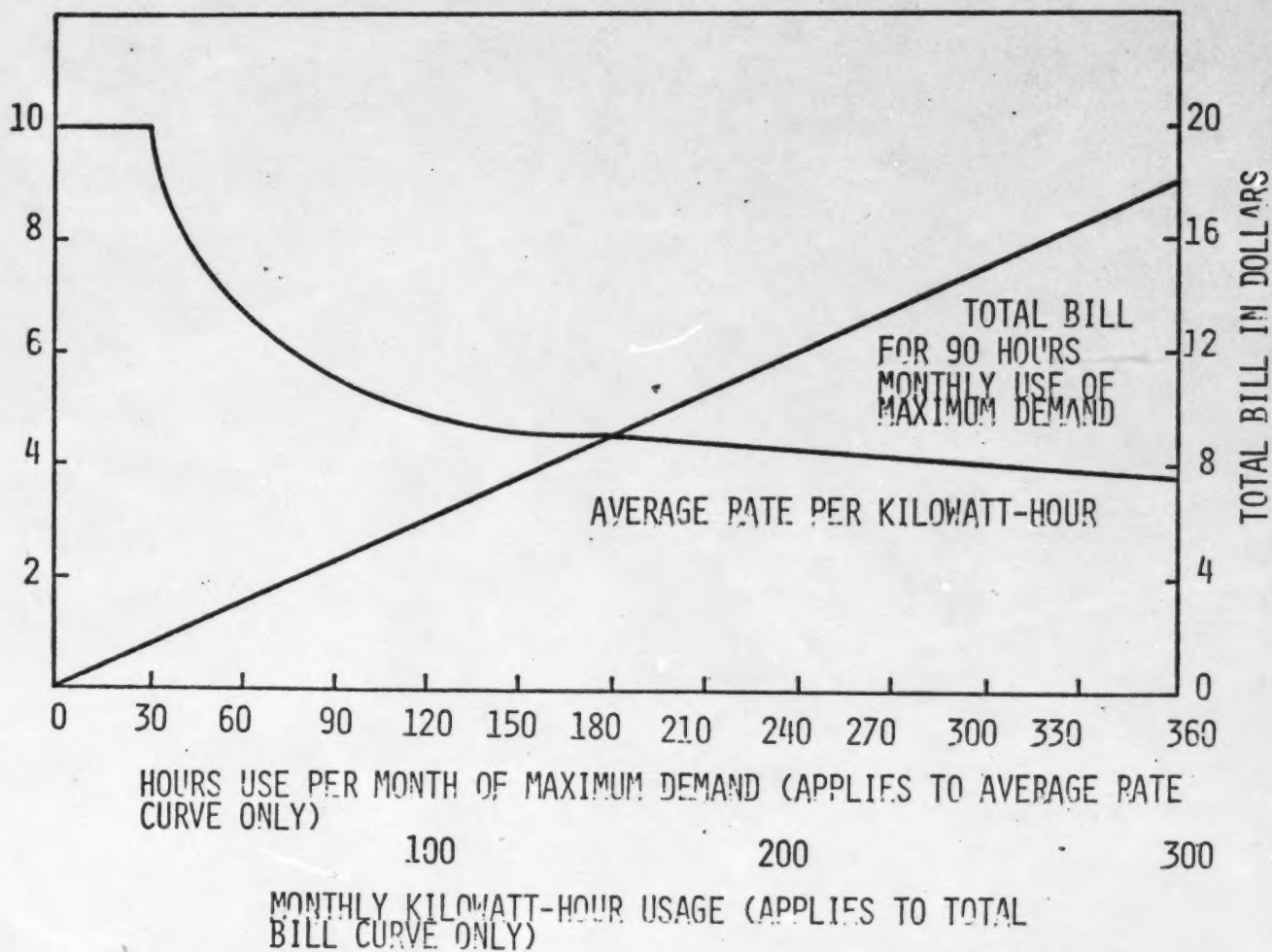


FIG. 2.5. BLOCK HOPKINSON DEMAND RATE

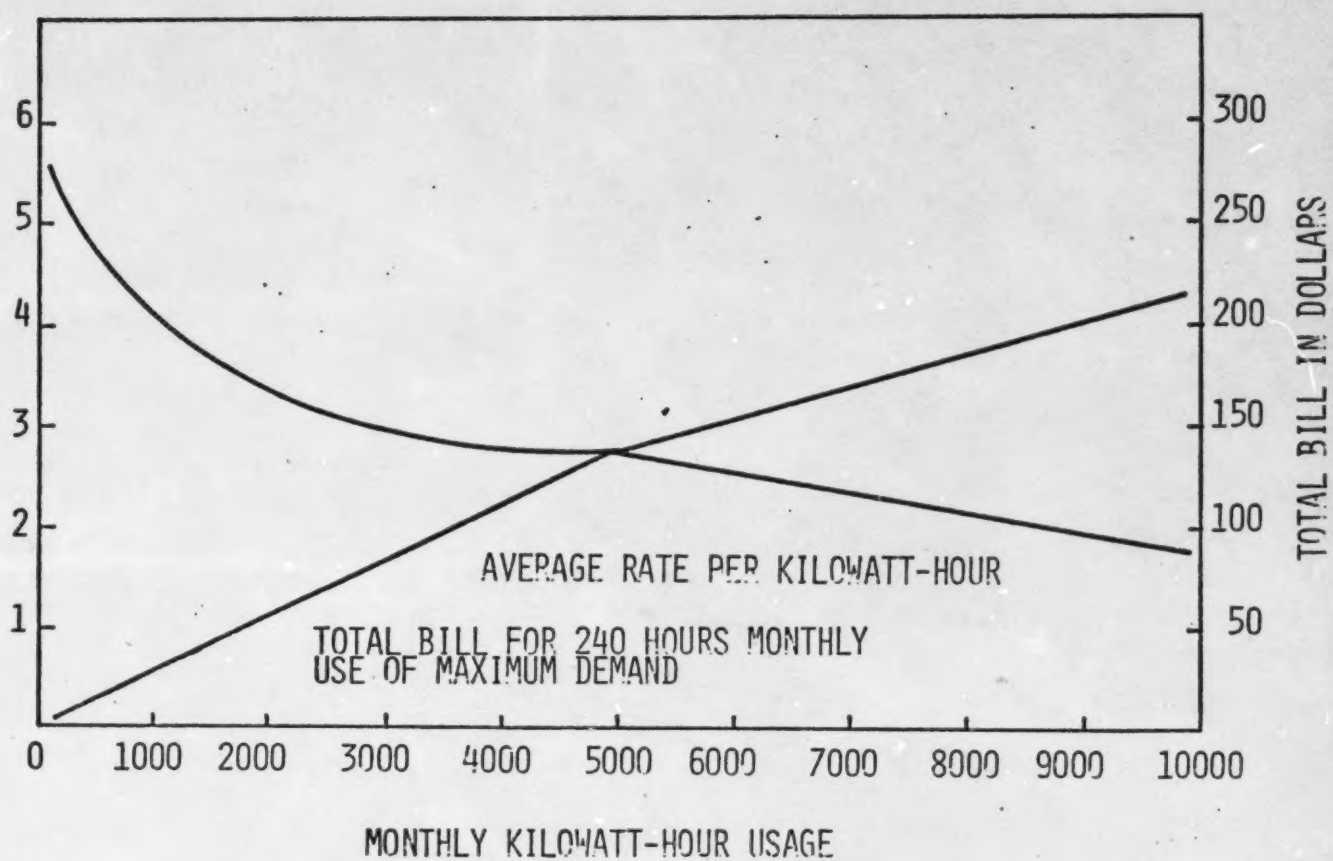


FIG. 2.6. DOHERTY OR THREE PART CHARGE DEMAND RATE

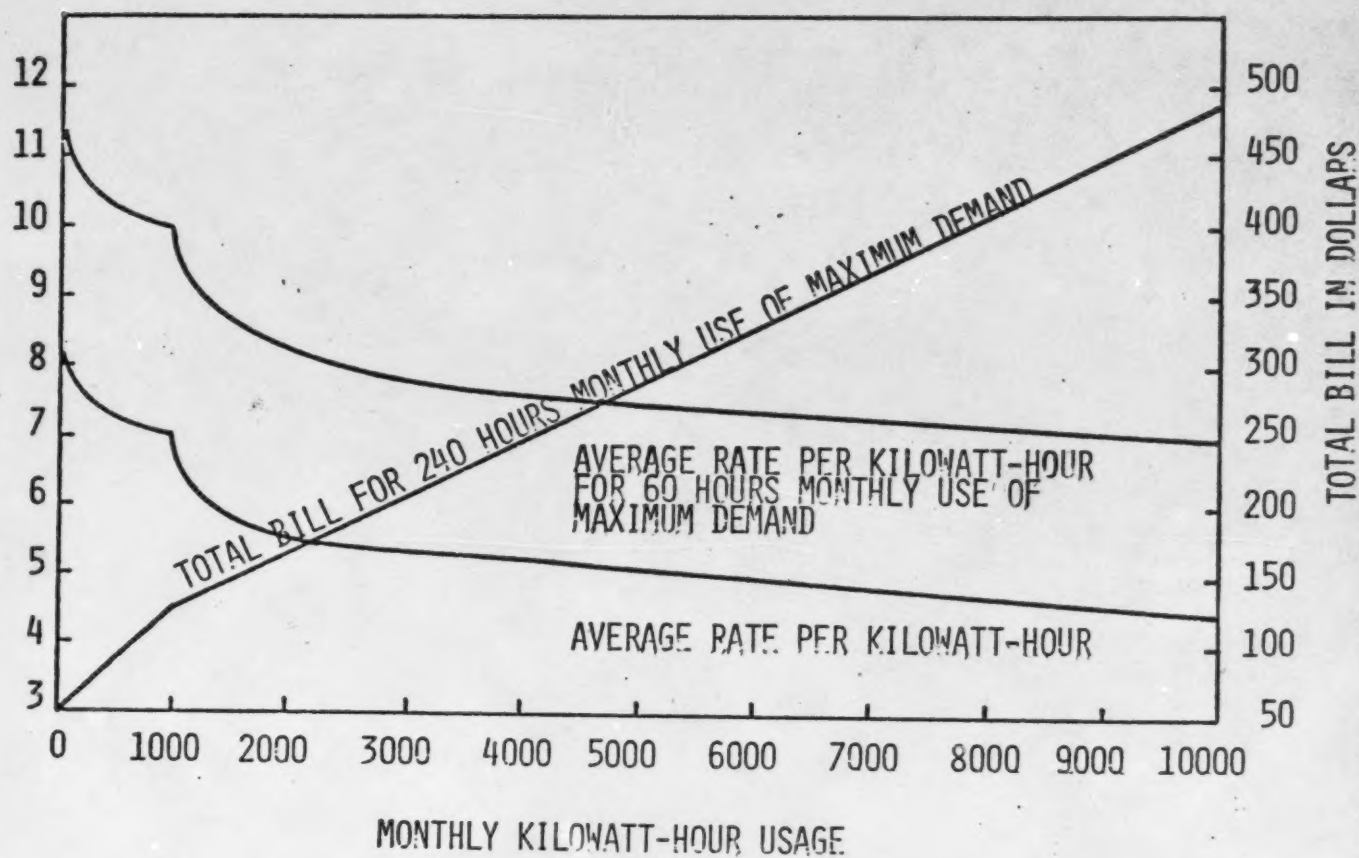


FIGURE 3.1

TEXAS POWER & LIGHT COMPANY
ELECTRIC BILL



ELECTRIC SERVICE BILL
TEXAS POWER & LIGHT COMPANY
A TAX-PAYING, INVESTOR-OWNED ELECTRIC UTILITY

FIGURE 3.1

PLEASE RETURN THIS PORTION WITH YOUR REMITTANCE

OFFICE	25)
ACCOUNT NUMBER	26)

27)
TOTAL DUE



ELECTRIC SERVICE BILL
TEXAS POWER & LIGHT COMPANY

SERVICE ADDRESS		OFFICE	ACCOUNT NUMBER		DEF. AND/OR INT. APPLD.
1)		2)	3)		16)
Prev. KWH Read	Est.	PREV. READ DATE		MISC.	
4)	5)	6)		17)	
Prev. KWH Read	PREV. READ DATE		*GUARD-LITE		
7)	8)		18)		
KWH MULT.	CURRENT KWH		BASE AMT. EXCL. FUEL		
9)	10)		11)		
PREV. KWH READ	FUEL COST PER KWH		FUEL COST		
A	12)		13)		
KW MULT.	OTHER KWH		SALES TAX		
B 1	14)		15)		
METERED KW	BILLED KW		TOTAL CURRENT STD. BILL		
C 4	D 7		19)		
RATE CODE	PAST DUE AFTER		BALANCE		
20)	21)		22)		
NAME		TOTAL DUE			
24)		23)			

PAY
THIS
AMOUNT

*SALES TAX NOT APPLICABLE
EXPLANATION OF RATE WILL BE FURNISHED ON REQUEST

FIGURE 3.2

TEXAS POWER AND LIGHT COMPANY

RESIDENTIAL AND COMMERCIAL RATE SCHEDULE

APPLICATION:

Applicable to any customer for all electric service used for residential purposes in an individual private dwelling or an individually-metered apartment, supplied at one point of delivery and measured through one meter.

Not applicable to resale or breakdown service in any event, nor to temporary, standby, or supplementary service except in conjunction with applicable rider.

NET MONTHLY RATE*

Billing Months of November
Thru April

\$5.00 which includes the
use of 30 kwh
\$2.03¢ per kwh for all
additional kwh

Billing Months of May
Thru October

\$5.00 which includes the
use of 30 kwh
\$2.77¢ per kwh for all
additional kwh

Minimum: \$5.00

*Company reserves the right to read meters at other than monthly intervals, and to bill customers on the basis of proportionate changes in the length of the blocks of the rate schedule.

Plus a charge per kwh of energy taken for fuel cost calculated in accordance with approved schedules. (This amount varies monthly. Historically it is between \$.005 per kilowatt hour).

TYPE OF SERVICE

Company will supply single-phase service (or three-phase service if available at the point of delivery) at 60 cycles and at any standard voltages available from Company's distribution system through one standard transformation. Where service of the type desired by the Customer is not already available at the point of service, special contract arrangements between the Company and the Customer may be required prior to its being furnished.

PAYMENT

Bills are due when rendered, and become past due if not paid within fifteen days thereafter. Service to customers having past due bills may be discontinued as provided in Company's Service Regulations, and an additional charge of not less than \$7.50 will be made before service is restored.

CONTRACT PERIOD

As provided for in the Agreement for Service.

NOTICE

This established schedule is subject to any change authorized by law, and to the provision of Company's Service Regulations.

FIGURE 3.3

TEXAS POWER AND LIGHT COMPANY

OUTDOOR LIGHTING RATE

APPLICATION:

Applicable to any customer in areas designated by Company for unmetered lighting service supplied exclusively to one or more outdoor type 175-watt white mercury vapor lamps operating automatically every night from dusk to dawn.

NET MONTHLY RATE

\$6.35 Per Lamp

Plus a charge per kwh of energy taken for fuel cost calculated in accordance with Schedule FCF.

INSTALLATION AND MAINTENANCE OF FACILITIES

Company will install, own and maintain at its own cost and expense at each lamp location, one mercury vapor luminaire complete with one 175-watt white mercury vapor lamp, lamp ballast, lamp operating equipment and an upsweep bracket on an existing Company-owned wooden pole or, at Customer's option, on an additional 30-foot wooden pole to be installed and maintained by company at an agreed-upon location not to exceed a distance of 125 feet from Company's existing secondary distribution lines or from any other lamp location served hereunder.

Company will, at its own cost and expense, replace all burned-out lamps. All expenses covering replacement of lamps and glass refractors due to vandalism or other breakage shall be borne by Customer.

DETERMINATION OF ELECTRIC ENERGY

Electric energy supplied in the operation of this lamp will be estimated at the rate of 68 kwh per lamp per month.

PAYMENT

Bills are due when rendered, and become past due if not paid within fifteen days thereafter. Service to customer's having past due bills may be discontinued as provided in Company's Service Regulations, and an additional charge of not less than \$7.50 will be made before service is restored.

CONTRACT PERIOD

As provided for in the Agreement for Services, but not less than 24 months.

NOTICE

This established schedule is subject to any change authorized by law, and to the provisions of the Company's Service Regulations.

FIGURE 3.4

TEXAS POWER AND LIGHT COMPANY

GENERAL SERVICE (SMALL) - SCHEDULE GS

APPLICATION:

Applicable to any customer for all electric service supplied at one point of delivery and measured through one meter.

Not applicable to resale or breakdown service in any event, nor to temporary, standby, or supplementary service except in conjunction with applicable rider.

NET MONTHLY RATE*

\$6.00 which includes the use of	30 kwh
6.40 per kwh next	270 kwh
3.80 per kwh next	700 kwh
2.75 per kwh next	1000 kwh
1.65 per kwh next	4500 kwh
1.20 per kwh for all additional kwh	

For each kw of demand in excess of 4, add 205 kwh to the 6.40 block

- Minimum: (a) Single-phase - \$6.00
(b) Three-phase - \$6.00 plus \$0.45 for each kw of demand in excess of 4.

*Company reserves the right to read meters at other than monthly intervals, and to bill customers on the basis of proportionate charges in the length of the blocks of the rate schedule.

Plus a charge per kwh of energy taken for fuel cost calculated in accordance with approved schedules. (This amount varies monthly. Historically it lies between \$.005 and \$.015 per kilowatt hour).

DETERMINATION OF DEMAND

The Demand shall be the kw supplied during the 15-minute period of maximum use during the current month, as determined by company's demand meter, but not less than 70% of the maximum kw similarly determined during the billing months of June, July, August, September, or October in the 12 months ending with the current month, nor less than 4 kw.

TYPE OF SERVICE

Company will supply single-phase service (or three-phase service if available at the point of delivery) at 60 cycles and at any standard voltages available from Company's distribution system through one standard transformation. Where service of the type desired by the Customer is not already available at the point of service, special contract arrangements between the company and the customer may be required prior to its being furnished.

PAYMENT

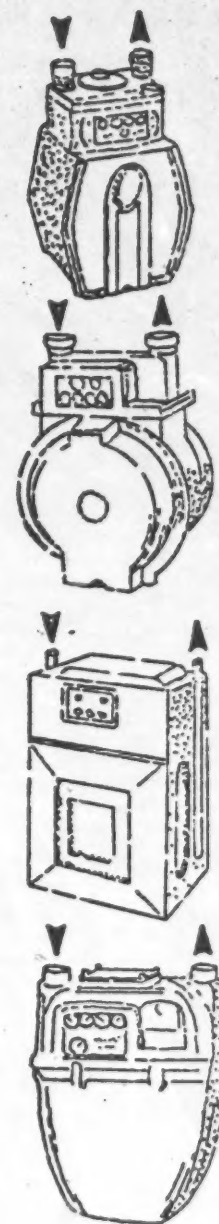
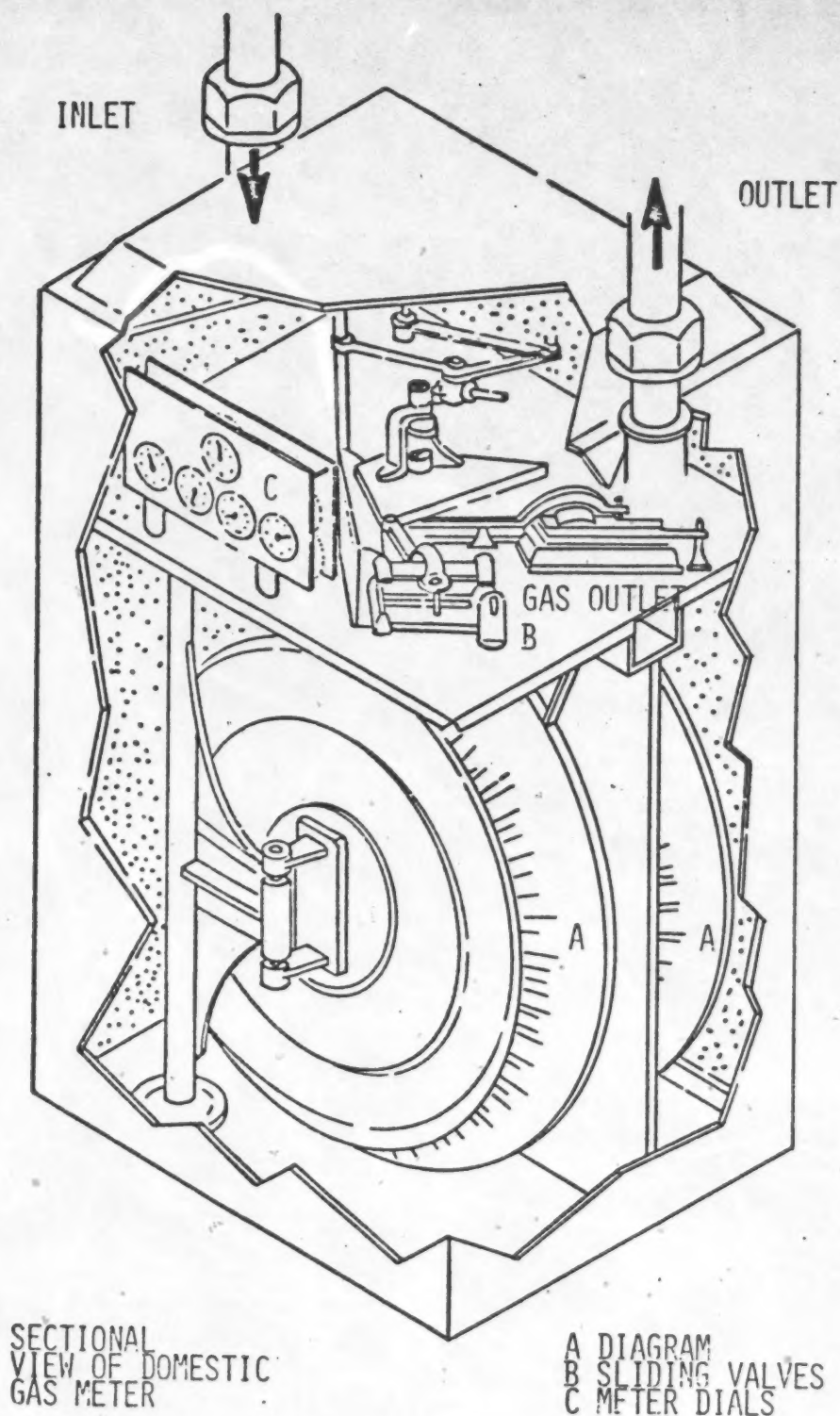
Bills are due when rendered, and become past due if not paid within fifteen days thereafter. Service to customers having past due bills may be discontinued as provided in Company's Service Regulations, and an additional charge of not less than \$7.50 will be made before service is restored.

CONTRACT PERIOD

As provided for in the Agreement for Service.

NOTICE

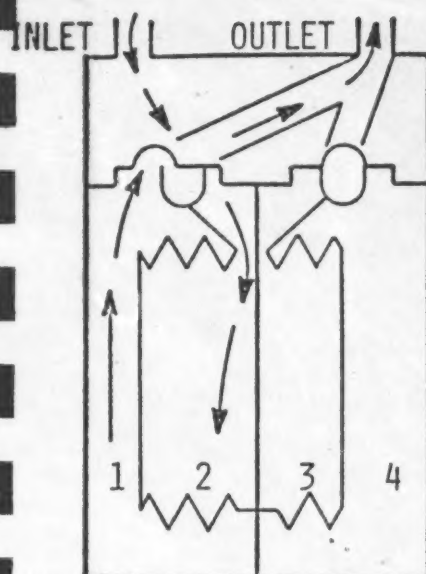
This established schedule is subject to any change authorized by law, and to the provisions of Company's Service Regulations.



A DIAGRAM
B SLIDING VALVES
C METER DIALS

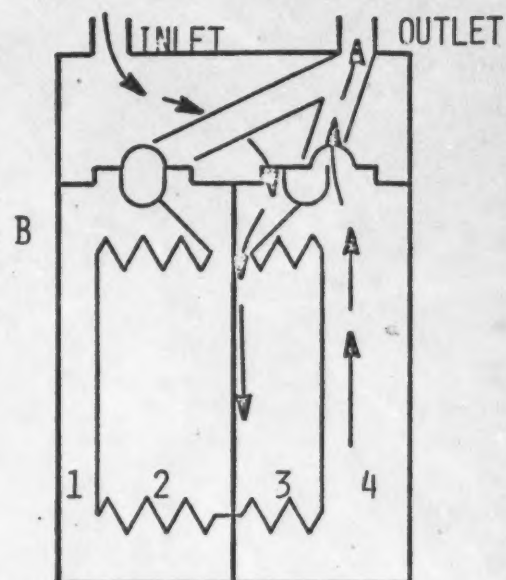
FIG. 4.1. HOW YOUR GAS METER WORKS

FIG. 4.2. HERE'S HOW SLIDING VALVES CONTROL THE GAS FLOW

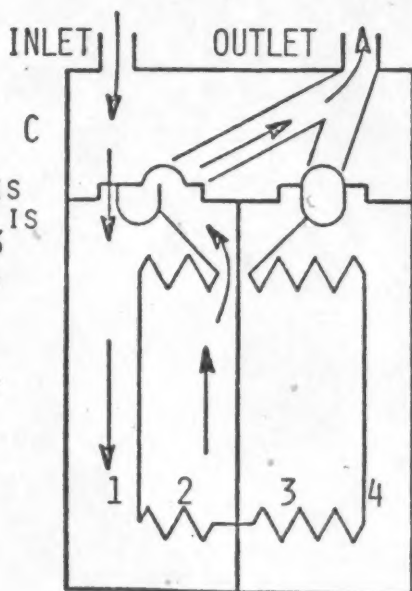


A
CHAMBER 1 IS EMPTY-
ING, 2 IS FILLING,
3 IS EMPTY AND 4 HAS
JUST FILLED.

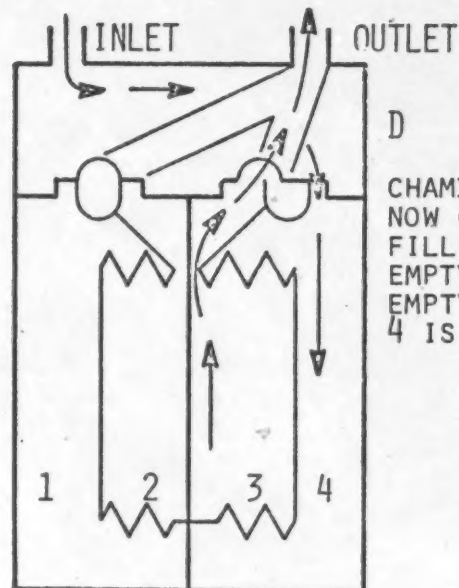
CHAMBER 1 IS NOW
EMPTY, 2 IS FULL,
3 IS FILLING, AND
4 IS EMPTYING.



B



CHAMBER 1 IS
FILLING, 2 IS
EMPTYING, 3
HAS FILLED,
AND 4 HAS
EMPTIED.



D

CHAMBER 1 IS
NOW COMPLETELY
FILLED, 2 IS
EMPTY, 3 IS
EMPTYING, AND
4 IS FILLING.

FIG. 4.3. HOW TO READ YOUR GAS METER.

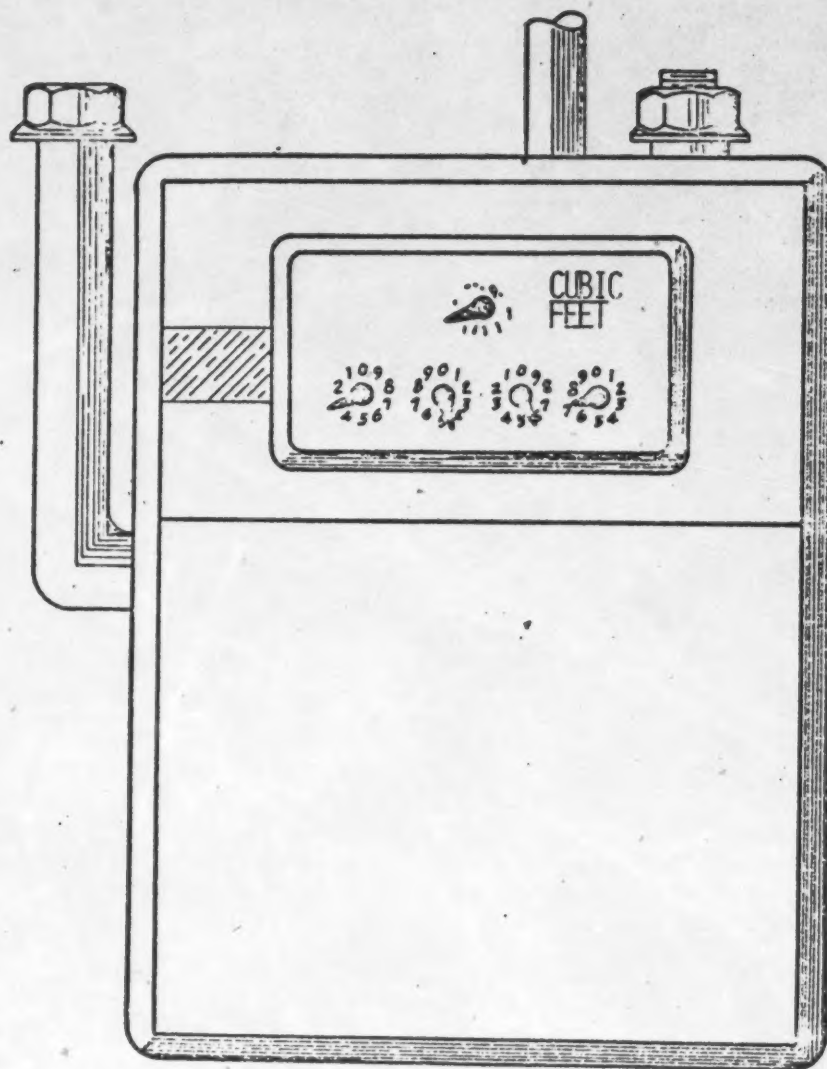


FIGURE 5.1

TEXAS LONE STAR GAS COMPANY
GAS BILL

Lone Star Gas
LONE STAR GAS COMPANY

Lone Star Gas Company
PLEASE RETURN THIS PORTION WITH YOUR PAYMENT

1) SERVICE AT	
2) METER	3) RATE
4) DATE	8) SERVICE
5) 7) 9)	
6) 10) 11)	
12) 13)	
14) 15)	

4 USE BACK OF STUB FOR CODE EXPLANATION

GROSS AMOUNT
16)

PROMPT PAYMENT
AMOUNT 18)

19)

20)

21) SEE EXPLANATION

- A APPLIANCE SERVICE
- B CONNECT CHARGE
- C CREDIT
- D DEPOSIT AND/OR INTEREST APPLIED
- E ESTIMATED READING
- F FINAL BILL
- G OTHER CHARGES
- H SPECIAL AIR COND RATE
- M METER EXCHANGE

SEE EXPLANATION

1. IN HUNDREDS OF CUBIC FEET

2. NO INCREASE OR DECREASE IN THE RATE THE COMPANY MUST PAY FOR NATURAL GAS PURCHASED FOR YOUR SERVICE. THE REGULATOR HAS DETERMINED THE RATE. THE RATE HAS BEEN DETERMINED BY THE REGULATORY AGENCIES HAVING JURISDICTION IN YOUR SERVICE AREA.

DU-D 200688-0

U 65

THIS PORTION MUST BE RETURNED WITH YOUR PAYMENT

62

FIGURE 5.2

LONE STAR GAS COMPANY

RESIDENTIAL AND COMMERCIAL RATE SCHEDULE

MONTHLY RATE:

First 1000 Cu.Ft. or Fraction Thereof \$2.4444 Gross: \$2.2000 Net.
Over 1000 Cu.Ft. @ \$1.5639 Per MCF Gross; \$1.4075 Per MCF Net.

No gas bill will be rendered to any residential or commercial consumer served under the above rate not consuming any gas during any monthly billing period, except that where customer's only use for gas service is in an outdoor grill and/or a fireplace starter, the amount shown for the first consumption block shall constitute a minimum monthly bill.

PROMPT PAYMENT PROVISION:

Net rate shall apply to all bills paid within ten days from monthly billing date. Thereafter, gross rate shall apply.

BILLING ADJUSTMENTS:

The following adjustment is applicable if letter "T" follows town name below.

The amount of each net monthly bill computed at the above stated rates shall be subject to the following adjustment: Plus an amount equivalent to the proportionate part of any new tax, or increased rate of tax, or governmental imposition or charge (except state, county, city, and special district ad valorem taxes and any taxes on net income) levied or assessed against the Company or on its gas business, as the result of any new or amended law, ordinance or contract, after July 1, 1975. Each gross monthly bill shall be adjusted proportionately.

The following adjustment is applicable if letter "G" follows town name below.

The amount of each net monthly bill computed at the above stated rates shall be subject to the following adjustment: Plus or minus the amount of any increase or decrease, respectively, above or below the \$1.0399 per Mcf level in the intracompany city gate charge as authorized by the Railroad Commission of the State of Texas or other regulatory body having jurisdiction for gas delivered to Lone Star Gas Company's distribution system for sale to residential and commercial consumers where such changes are caused by increases or decreases in the cost of gas purchased by the Company. Each gross monthly bill shall be adjusted proportionately. (The GCA for Corsicana, Texas, varies per month. Historically it has been between \$2.50 and \$1.50 CCF).

BILLING PERIOD:

The above rate schedule is applicable to each residential and commercial consumer per month or for any part of month for which gas is used at the same location.

(CORSICANA-TG)